Biological Assessment : Effects to Indiana Bats from Ongoing and Anticipated Future Military Activities

Prepared for :
Camp Atterbury
Edinburgh, Indiana

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Draft

BIOLOGICAL ASSESSMENT

EFFECTS TO INDIANA BATS

FROM

ONGOING AND ANTICIPATED FUTURE MILITARY ACTIVITIES

CAMP ATTERBURY EDINBURGH, INDIANA

PREPARED FOR

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EXECUTIVE SUMMARY

This Biological Assessment (BA) addresses effects to Indiana bats *(Myotis sodalis)* from ongoing and anticipated future military activities at Camp Atterbury, Indiana. The primary mission of Camp Atterbury is to provide adequate facilities, training areas, and ranges to maintain the readiness of the Army National Guard (ARNG) and the Air National Guard (ANG) for their assigned mission of being prepared to protect the United States in the event of mobilization. At the same time, Camp Atterbury is subject to Army Regulation (AR) 200-2, *Environmental Effects of Army Actions*, sets forth "policy, responsibilities, and procedures for integrating environmental considerations into Army planning and decisionmaking." Army Regulation (AR) 200-3, *Natural Resources—Land, Forest, and Wildlife Management*, sets forth "the policy, procedures, and responsibilities for the conservation, management, and restoration of land and the natural resources thereon consistent with the military mission and in consonance with national policies." The Army, at all levels, is committed to carrying out mission requirements in harmony with the requirements of the Endangered Species Act (ESA) of 1973 (Title 16 of the *United States Code* [U.S.C.] §§ 1531–1544).

Indiana bats were captured on Camp Atterbury during surveys conducted in 1997 and 1998. The United States Fish and Wildlife Service (USFWS) lists the Indiana bat as an endangered species. Legal protection of federally threatened and endangered species is provided by the Endangered Species Act of 1973 (Public Law 93–205), as amended. No habitat designated as critical for Indiana bats occurs within boundaries of Camp Atterbury.

The purpose of this Biological Assessment is to determine whether the federally-listed endangered Indiana bat may be adversely affected by certain military activities that occur at Camp Atterbury. The intent is also to develop mechanisms to effectively integrate endangered species protection and conservation with the military mission. This BA analyzed three aspects of the proposed action with reasonable potential to affect Indiana bats: (1) effect of current and anticipated future military activities on suitable summer habitat; (2) effect of exposure to sound; and (3) effect of exposure to chemicals in training materials.

The results of this BA are as follows:

- Direct effects to Indiana bats from military activities are likely to be rare. The areas of greatest risk are live fire target practice and smoke grenade use.

- Indiana bats may be capable of hearing sounds generated by training activities, but peak sound energy is likely to be well below frequencies audible to bats, and the sounds are not likely to startle or frighten them.

- Repeated exposure of individual bats to terephthalic acid (TPA) in M83 smoke grenades, smoke pots, and smoke generators on Camp Atterbury is unlikely. The release of smoke obscurants containing TPA (M18 grenades) currently used on the installation within 36 m of trees is avoided to the maximum extent practical during the Indiana bat maternity roosting season. Previous studies have found that no chronic effects to an individual Indiana bat would occur if exposure is limited to 105 or fewer grenades. Camp Atterbury plans to eventually use an average of just nine TPA grenades per day during the summer training season, and the grenades will be used at different sites on the installation.

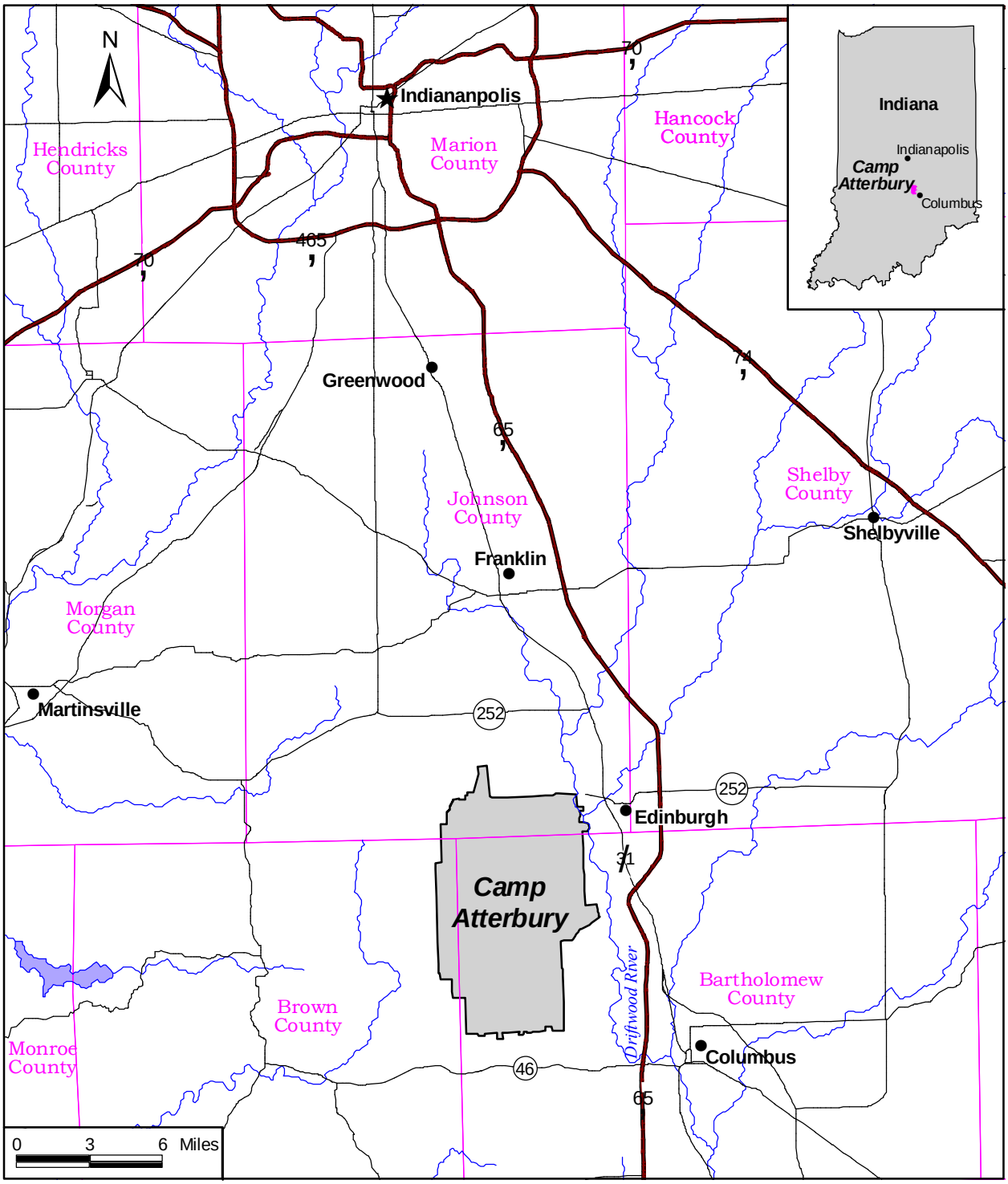
Ongoing and anticipated future military activities at Camp Atterbury may affect but are not likely to adversely affect Indiana bats. Every prudent measure should be taken to minimize the destruction of habitat and incidental take of Indiana bats. Suggested measures resulting from the impact analysis in this document are to limit obscurant smoke grenade use during the summer maternity roosting season (April to September) to at least 36 m away from trees and at least 120 meters away from perennial watercourses when practical; if grenade use near streams is unavoidable, then it should be limited to daylight hours only. In addition, military exercises should not exceed their present level in training areas 4A and 5C, as these areas contain greater than 68 percent potential Indiana bat habitat. With proper management of and leadership in military training and land management, Camp Atterbury can support the Indiana bat in conjunction with continuing its military mission. Although some incidental loss may occur, a balance can be achieved that provides for protection and recovery of the Indiana bat with minimum impact on the military mission.

SECTION 1.0:
INTRODUCTION

This Biological Assessment (BA) addresses effects to Indiana bats *(Myotis sodalis)* from ongoing and anticipated future military activities at Camp Atterbury, Indiana (Figure 1–1). The primary mission of Camp Atterbury is to provide adequate facilities, training areas, and ranges to maintain the readiness of the Army National Guard (ARNG) and the Air National Guard (ANG) for their assigned mission of being prepared to protect the United States in the event of mobilization. Such readiness results only from receiving high-quality training that incorporates all mission elements and tasks and provides the high-quality, realistic training to the individuals and units that train there. At the same time, Camp Atterbury is subject to Army Regulation (AR) 200-2, *Environmental Effects of Army Actions*, sets forth "policy, responsibilities, and procedures for integrating environmental considerations into Army planning and decisionmaking." Army Regulation (AR) 200-3, *Natural Resources—Land, Forest, and Wildlife Management* sets forth "the policy, procedures, and responsibilities for the conservation, management, and restoration of land and the natural resources thereon consistent with the military mission and in consonance with national policies." The Army, at all levels, is committed to carrying out mission requirements in harmony with the requirements of the Endangered Species Act (ESA) of 1973 (Title 16, U.S.C. §§ 1531–1544).

A total of 36 Indiana bats have been captured on Camp Atterbury during surveys conducted in 1997 and 1998 (Montgomery Watson and 3D/I, 1998; Montgomery Watson, 1999). The United States Fish and Wildlife Service (USFWS) officially listed Indiana bats as an endangered species on March 11, 1967 (*Federal Register* 32[48]:4001) under the Endangered Species Preservation Act of October 15, 1966 (80 Stat. 926: 16 U.S.C. 668aa[c]). The official listing process provides the Indiana bat with the legal protections provided under the ESA. No habitat designated as critical for Indiana bats occurs within the boundaries of Camp Atterbury.

This BA was prepared in accordance with ESA Section 7 regulations (50 CFR §§ 402.14[c]), in which formal consultation is initiated between Camp Atterbury and the USFWS to investigate the effects of military activities on the Indiana bat. This BA also incorporates, by reference, information from the Camp Atterbury *Integrated Natural Resources Management Plan* (INRMP) (Tetra Tech, 2001), the Camp Atterbury



LEGEND

- Camp Atterbury
- City
- River
- County Boundary

Roads

- Highway
- Primary Road

Location Map

Camp Atterbury
Edinburgh, Indiana

Figure 1-1

Endangered Species Management Plan for the Indiana Bat, which is included in the INRMP as an appendix, and a previous BA (Montgomery Watson and 3D/I, 1998) which was prepared to assess the effects of construction and operation of a proposed multi-purpose training range (MPTR) on the Indiana bat. The subsequent Biological Opinion for the construction and operation of the MPTR was issued by the USFWS Bloomington Field Office (USFWS BFO) on December 4, 1998 (Appendix A).

Informal ESA Section 7 consultation was initiated in November 1997 when Tetra Tech, acting as a representative of Camp Atterbury, sent a letter to officially notify the USFWS of Camp Atterbury's intent to prepare and implement an INRMP. Further informal discussions with USFWS BFO personnel were held at Camp Atterbury on 3 March 1999. These discussions focused on the effects of implementation of the INRMP, in particular the forest management program, and military activities on the Indiana bat. Since that time, discussions with the USFWS have occurred on a regular basis.

1.1 REPORT ORGANIZATION

This BA analyzes the effects of the proposed action on the endangered Indiana bat. The document is organized into five sections and four appendices.

- Section 1.0, Introduction, provides background regarding the Biological Assessment.
- Section 2.0, Environmental Baseline, contains a description of the project area—Camp Atterbury, Indiana.
- Section 3.0, Description of the Proposed Action, provides a description of the ongoing and anticipated future military activities at Camp Atterbury.
- Section 4.0, Species of Concern, presents the natural history and occurrence of Indiana bats in and near the project area, as well as a description of the scope of analysis, and an effects analysis area. Effects of the proposed action on Indiana bats are then analyzed. A statement of finding is provided.
- Lists of references, acronyms and abbreviations, and preparers follow Section 4.0.

- The appendices contain the Biological Opinion for the construction and operation of the MPTR, Camp Atterbury range munition data, annual reports of Indiana bat management activities at Fort Leonard Wood and Camp Atterbury submitted to the USFWS, and agency correspondence related to this biological assessment.

1.2 PROJECT OBJECTIVES

The primary objective of this BA is to assess the effects of the proposed action on Indiana bats. This document is prepared to fulfill requirements of the Endangered Species Act. The assessment uses the best available scientific and commercial data to analyze effects of habitat modification. This document also describes elements of the proposed action designed to avoid or minimize effects to listed species.

The analysis focuses on three aspects of the proposed action with reasonable potential to affect Indiana bats: (1) effect of current and anticipated future military activities on suitable summer habitat; (2) effect of exposure to sound; and (3) effect of exposure to chemicals in training materials. Because no Indiana bat hibernacula are located on Camp Atterbury, the analyses herein focus on Indiana bats that roost and forage on the installation during the summer season (15 April to 15 September).

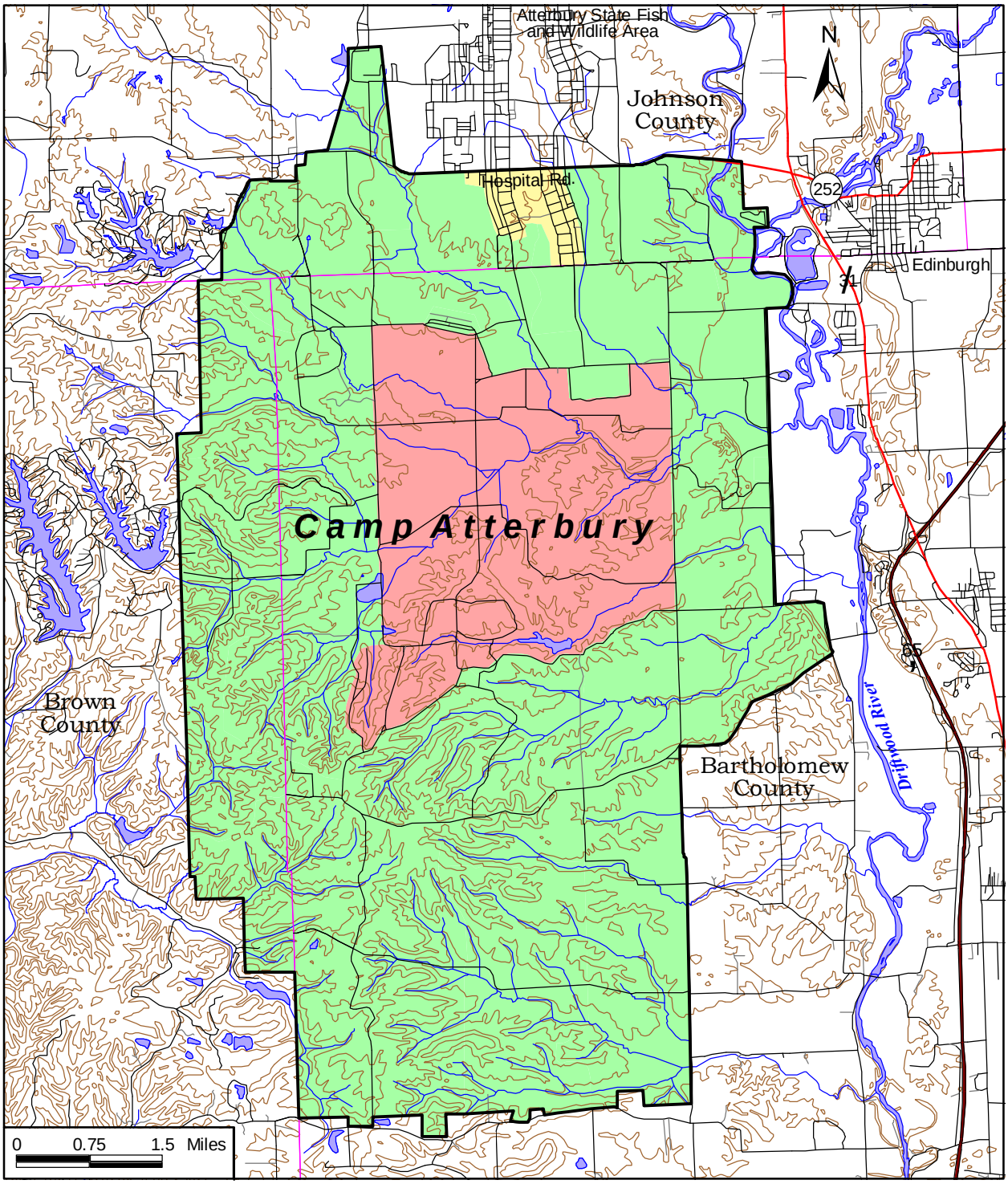
This document provides recommendations and guidance for the Camp Atterbury natural resources manager to implement management measures that serve to protect and enhance suitable Indiana bat habitat found on the installation.

SECTION 2.0:
ENVIRONMENTAL BASELINE

Camp Atterbury comprises 33,132 acres in south central Indiana, overlapping portions of Bartholomew, Brown, and Johnson Counties (Montgomery Watson, 1997). Four major land uses present on the installation are the cantonment area (approximately 655 acres or approximately 2 percent of the installation); the impact area (6,113 acres or 19 percent) that also contains a 300-acre air-to-ground range; and the battalion training areas (26,364 acres or 79 percent). The cantonment area is located in the northern portion of the post. The impact area and range are located in the center of the installation, surrounded by the training areas (Figure 2-1) (SAIC, 1998).

The northern third of the installation was glaciated and is now relatively flat with gently rolling hills. This portion of the installation is dominated by bottomland hardwood forest, but in slightly drier areas the bottomland forest may be mixed with oak-hickory forest. The southern two-thirds of the installation has steep slopes with narrow valleys. It is primarily forested with oak-hickory in the uplands and bottomland hardwood forest in the narrow floodplains of the lower drainages (USFWS, 1998; Montgomery Watson, 1999).

Approximately 26,488 acres (80 percent) of Camp Atterbury are forested (Montgomery Watson, 1997). Forest stand age and density vary greatly because prior to construction of the base in 1942, much of the land was used for agriculture (USFWS, 1998). Common tree species in the bottomland hardwood forest include American sycamore (*Platanus occidentalis*), green ash (*Fraxinus pennsylvanica*), eastern cottonwood (*Populus deltoides*), red maple (*Acer rubrum*), shellbark hickory (*Carya laciniosa*), sweetgum (*Liquidambar styraciflua*), and several species of elms (*Ulmus* spp.) and oaks (*Quercus* spp.). Upland forests are dominated by shagbark hickory (*C. ovata*), pignut hickory (*C. glabra*), red hickory (*C. ovalis*), white oak (*Q. alba*), northern red oak (*Q. rubra*), black oak (*Q. velutina*), chestnut oak (*Q. prinus*), American beech (*Fagus grandifolia*), sugar maple (*A. saccharum*), and tuliptree (*Liriodendron tulipifera*) (Montgomery Watson, 1999). In addition to their primary function as training areas, forested portions of the installation are managed for multiple uses, including commercial timber harvest, wildlife habitat, protection of unique natural areas, watershed protection, recreation, and aesthetics (USFWS, 1998).



LEGEND

- Installation Boundary
- Cantonment Area
- Training Area
- Impact Area

Roads

- Interstate
- Primary Road
- Secondary Road
- Other Road

- Lake
- Stream
- 10-Meter Contour
- County Boundary

Source: Camp Atterbury, 1999.

Installation Map

Camp Atterbury
Edinburgh, Indiana

Figure 2-1

Camp Atterbury lies within the watershed of the East Fork of the White River. Most of the installation drains eastward toward the Driftwood River, which runs parallel to and outside of the eastern base boundary. Primary streams that flow eastward across the installation are Nineveh Creek, Muddy Branch, Lick Creek, Catherine Creek, and Sugar Creek. The floodplain vegetation along these streams is primarily several stages of bottomland hardwood forest. In some cases, such as along Nineveh Creek, the forest has been converted to fields and early successional forest. Herbaceous/shrub marshes have developed in several of these stream systems because of the influence of beavers (*Castor canadensis*) (Montgomery Watson, 1999).

A more detailed description of the physical environment of Camp Atterbury, including topography, climate, geology, soils, air quality, water resources, wildlife, vegetation, and land use, is contained in Section 3 of the Camp Atterbury INRMP (Tetra Tech, 2001). The description of these resources is incorporated by reference.

SECTION 3.0:
DESCRIPTION OF THE PROPOSED ACTION

The proposed action is the implementation of current and future anticipated military activities at Camp Atterbury, Indiana. The purpose of the proposed action is to carry out the military missions of Camp Atterbury. The missions of the Indiana Army National Guard (INARNG) and Camp Atterbury are described below.

3.1 MILITARY MISSION

The Federal Mission is to provide trained, well-equipped, and combat-ready men and women who can augment the active force during national emergencies or war. As part of the total Army or Air Force, the INARNG provides operationally ready units and qualified personnel for active duty.

The State Mission is to provide trained, well-equipped men and women capable of reacting to various state emergencies. Under order of the governor, the INARNG provides protection of life and property and preserves peace, order, and public safety. Missions funded by the state include disaster relief, search and rescue, protection of vital public services, and support to civil authorities during disorder.

The Community Mission is to provide support to the community through programs that enrich the way of life of the community. This mission is accomplished by providing youth outreach and educational programs, participating in charitable causes, providing facilities for public gatherings, providing assets for improvements of community grounds/facilities, and adding to the definition of the community's personality. This mutual support system, community and National Guard, serves to enhance the citizen's lifestyle in a great number of ways.

The INARNG has three major commands (MACOMs) within the state organization, whose missions are as follows:

- 38th Infantry Division – Provide command, control, administrative, and logistical support for an infantry division; organize, man, train, equip, and sustain units to carry out the lawful orders of state and federal command authorities.

- 76th Separate Infantry Brigade (Enhanced) – Ready to be deployed anywhere in the world in 90 days and be prepared to fight and win with minimal casualties.

- 81st Troop Command – Organize, man, train, equip, and sustain units capable of mobilizing, deploying, fighting, and winning upon commitment to the gaining command.

Institutional Missions. The 138th Regiment (Combat Arms), Indiana Military Academy, is located at Camp Atterbury. The military academy provides regional combat arms individual training, including an air assault school, military occupational specialty qualification, additional skill identifiers, and noncommissioned officer education system training for the Army National Guard, the United States Army Reserve, and the active component, as well as the Officer Candidate School for the state. The military academy provides management and quality assurance oversight for the functionally aligned training battalions within its region and monitors and coordinates academic instruction, food, and lodging for soldiers participating in courses at its training sites. The regiment works in conjunction with the National Guard Bureau (NGB), the Training and Doctrine Command (TRADOC) Coordinating Element, the Regional Coordinating Element, and the Proponent Schools. The regiment plans and programs training within its region based on requirements identified by the individual training branch, the Army Program for Individual Training, and the Training Requirements Arbitration Plan.

The primary mission of Camp Atterbury is to receive, support, and prepare active and reserve component personnel for field deployment as a federally owned State Operated Mobilization Site (SOMS). Camp Atterbury is the prime resource within the state from which the Guard provides the means for training its soldiers to meet its federal, state, and community missions.

In peacetime, Camp Atterbury operates under the National Guard Bureau and the Military Department of Indiana (MDI) as a major training site for Reserve Component and Active Duty forces. To support this

training operation, Camp Atterbury provides support facilities, training areas, and ranges for one combat or combat-support brigade conducting battalion-level Army Training Evaluation Programs (ARTEPs). Should the need arise, Camp Atterbury can be expanded to support training and facilities for up to two brigades (Tetra Tech, 2001).

If mobilization should occur, Camp Atterbury has a "stand-alone" status under the United States Army Forces Command (FORSCOM). Camp Atterbury's mobilization mission is to improve installation activities and facilities to receive, support, train, and prepare Active and Reserve Component personnel for deployment to their mobilization assignments (USACE, 1994). The Camp Atterbury post-mobilization mission is to operate a Mobilization Station as a separate FORSCOM installation capable of supporting up to 14,000 mobilized troops and to support a 4,000-troop mission subsequent to the initial mobilization mode. Camp Atterbury is designed as a SOMS for up to brigade-sized combat elements (Tetra Tech, 2001).

3.2 CURRENT MILITARY ACTIVITIES

Currently sized at 4,200 troops according to NGB Pamphlet 570-3, Camp Atterbury is used an average of 46 weekends and 23 weeks per year by National Guard and Reserve Component units. Several Active Component units and Department of Defense agencies train intermittently on a daily basis. Area police agencies and other civilian groups use Camp Atterbury's facilities and ranges during off-season periods after obtaining preauthorization (Tetra Tech, 2001).

Annual Training Year

A typical reserve component training year normally includes one weekend per month. The two days per month, plus 15 days of annual training, give each unit a total of 39 days annually in which to conduct its required training events. The typical training year for training facilities is 133 days, which is the sum of available training days from May through August plus weekend days during the rest of the year. Accelerating training to either a moderate or an intensive pace is considered only if units are mobilized. For each range or facility, the number of training days that the range or facility is available for use is used in the development of statistical information to determine requirements (INARNG, 1999).

Usage Data

Camp Atterbury is equipped with the Range Facility Management Support System (RFMSS) version 3.5. RFMSS provides a standard, integrated system to efficiently assist installation commanders in providing training support for units and schools to manage valuable training lands and ranges at Army installations and in theaters of operations. RFMSS supports all major range management processes, including scheduling of ranges and training areas; unit and range control of approval process; automation of range firing desk operations; resolution of safety and environmental conflicts; and creation and management of Surface Danger Zones (SDZ). RFMSS allows units to reserve range and training area assets as much as two years in advance (HSMS/ISM, 2001). Camp Atterbury has not fully implemented RFMSS, as it is primarily used for scheduling. For the purposes of this report, it is assumed that ranges scheduled and captured in RFMSS are actually used by the scheduling unit (INARNG, 1999).

Institutional Training

The 138th Regiment (Combat Arms) is responsible for military occupational specialty (MOS) producing institutional courses. Among the types of courses taught are Officer's Candidate School (OCS), MOS training, air assault school, instructor training, and leader training. There are no scheduled or recorded data supporting the use of range and maneuver areas for courses taught by the 138th Regiment.

Type Unit Selection

The primary users of the training facilities located on Camp Atterbury are those taking institutional courses taught by the 138th Regiment and the INARNG. Unit types within the INARNG are light infantry (five battalions), mechanized infantry (one battalion), field artillery, and support structure (combat support (CS) and combat service support (CSS)).

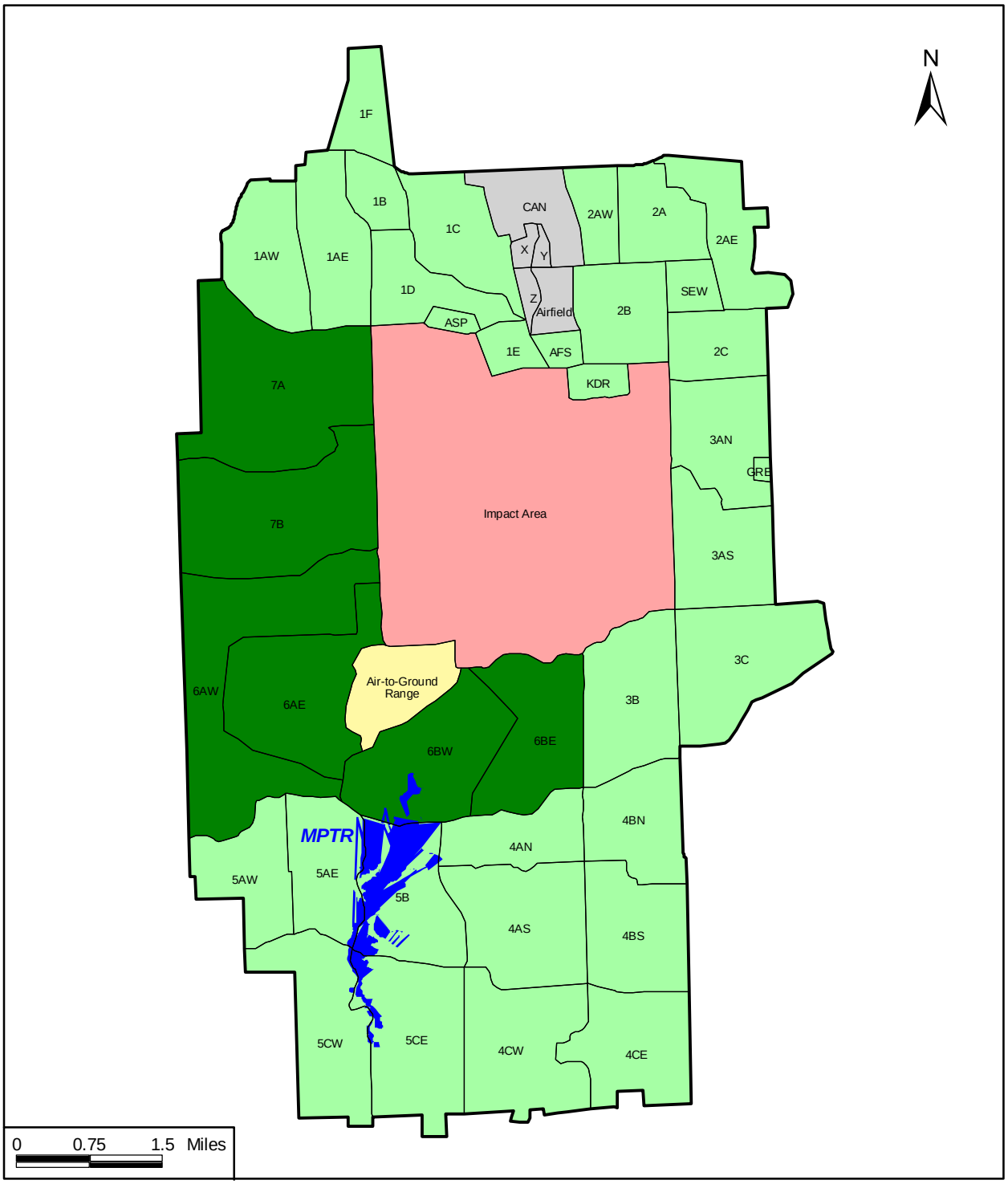
Training and Maneuver Areas

Camp Atterbury has approximately 27,000 acres of maneuver training land divided into seven training and maneuver areas, as shown in Figure 3-1. The terrain of the training areas varies, ranging from fairly flat in the north to steep hills in the southern portion of the post. Boundaries are formed by improved roads and natural barriers such as rivers and streams. The training areas are used for multiple training regimens, including artillery firing, mortar firing, machine gun and grenade range practice, and activities at mock battle sites and bivouac areas (FORSCOM, 1993). Table 3-1 describes the uses for each training area.

There are two types of maneuver land on Camp Atterbury: light and heavy. Most (19,200 acres) of the available training areas at Camp Atterbury are classified as light maneuver. Heavy maneuver training areas, which cover 7,800 acres at Camp Atterbury, are at a premium for the INARNG (SAIC, 1998; INARNG, 1999). The only heavy maneuver areas in Indiana are located at Camp Atterbury, and one mechanized brigade is located in the state; however, most of the brigade's mechanized equipment is located out of state at its mobilization and training equipment site (MATES) (INARNG, 1999). Construction is under way for a multi-purpose training range (MPTR) at Camp Atterbury for use by mechanized brigades of the INARNG as well as out-of-state and active component units. The anticipated completion date is January 2003.

Proposed training in the MPTR will involve Abrams M1 tanks, AH-1E/F attack helicopters, Bradley fighting vehicles, aerial traced, wire guided (TOW) launch vehicles, and dismounted infantry. Tanks and other vehicles will fire at fixed and moving targets located in the impact area from six defilade firing points. Simulators and colored smoke grenades will be used in some training activities to simulate realistic battlefield conditions. Only training practice (TP) rounds will be fired; no high explosive or "dud" producing rounds will be fired within the MPTR. Additional descriptions of the proposed MPTR can be found in the *Environmental Impact Statement (EIS) for the Proposed Upgrade of Training Areas and Facilities for Camp Atterbury, Indiana* (SAIC, 1998).

Historically, ARNG collective maneuver training tasks have been conducted during annual training (AT) rotations, which have alternated between Camp Atterbury and various other sites. These have included Fort Knox, Kentucky; Fort Campbell, Kentucky; and Camp Grayling, Michigan.



LEGEND

- Light Maneuver Area
- Heavy Maneuver Area
- Air-to-Ground Range
- Common Impact Area
- MPTR
- Cantonment Area and Other Areas
- Installation Boundary
- Training Area Boundary

Source: Camp Atterbury, 1999.

Training and Maneuver Areas

Camp Atterbury
Edinburgh, Indiana

Figure 3-1

Table 3-1

Training Areas and Acreage

Training Areas (subdivisions)	Size (acres)	Terrain	Type of Training	Training Facilities
1 (6)	3,000	Generally flat or gently rolling with light to medium underbrush	Driver training for tracked and wheeled vehicles	Four artillery firing points; an NBC chamber; a drop zone; two observation points; the Wilder Road Machine Gun Range; the Ammunition Storage Point (ASP); the Tipton Tank Range; the McGee 1,200-m moving target range; and an administrative bivouac site
2 (3)	3,000	Generally flat to gently rolling, with light to dense underbrush, growing more dense toward the northeastern portion	Light infantry	Ten artillery firing points; two land navigation courses; a physical conditioning course; medical litter course; a rappelling tower; an airfield; an engineering training site; 81-mm SRTR training range; two drop zones; and two administrative bivouac sites; a new ASP will be located in the Training Area
3 (3)	3,600	Flat in the north, but becoming more rolling toward the southern portion	Dismounted tactical training	Fourteen artillery firing points; live and practice hand grenade ranges; the Lick Creek platoon assault range; and a squad live-fire range
4 (3)	5,100	Very rugged in the northwest portion of 4A; western portion of 4C becomes more rolling toward the eastern side. Vegetation is medium to heavy	Day and night convoy training, dismounted infantry defense, patrolling, and artillery operations	Eight artillery firing points; a helicopter door gunnery range; a squad live-fire range; and a land navigation course
5 (3)	4,500	Extremely rugged in central portion of 5A and eastern portion of 5C, with deep ravines and heavy timber	Artillery firing and rugged dismounted maneuver training	Nine artillery firing points

Table 3-1

Training Areas and Acreage (continued)

Training Areas (subdivisions)	Size (acres)	Terrain	Type of Training	Training Facilities
6 (2)	4,600	Very rugged terrain throughout entire area. Eastern portion becomes more rolling and open than remainder of area	Mounted and dismounted infantry training	Six artillery firing points; one mortar firing point; the ANG bombing and strafing range; and two squad live-fire ranges
7 (2)	3,200	Generally rolling terrain, although western portion more difficult to traverse because of deep ravines and steep stream banks	Mounted and dismounted training	Two artillery firing points; a land navigation course; the Tipton Trail Tank Range; a target area; two mortar firing points; and two observations points

Sources: Camp Atterbury, 1992; SAIC, 1998.

Ranges and training areas at Camp Atterbury support Army Standard (AS), individual, and crew served weapons qualifications, and allow collective training through company or team level of combat, combat support (CS), and combat service support (CSS) tasks for a brigade-sized element. At Camp Atterbury, the INARNG maintains an Organizational Maintenance Shop (OMS), a Combined Support Maintenance Shop (CSMS), a Unit Training Equipment Site (UTES), a State Military Academy for Officer and Non-Commissioned Officer (NCO) development, and a Troop Command Armory for 800 troops (Tetra Tech, 2001).

Training in the 6,113-acre centrally located common impact area on Camp Atterbury consists only of direct-fire range firing and live-fire mortar and artillery training (Camp Atterbury, 1993). There are 28 ranges with 720 firing points located within the perimeter, and there are 22 mortar and 55 artillery firing points, from which mortar and artillery are fired directly into the impact area. Most of the ranges extend across the northern boundary of the impact area with most mortar firing points running along the eastern, southern, and western boundaries. The impact area is used mainly by the Army; however, the Air National Guard (ANG) occasionally uses the area to drop inert bombs (SAIC, 1998).

The air-to-ground range, which consists of approximately 300 acres and is located in the southwestern portion of the impact area, is used by the ANG for aircraft training. Aircraft approach the area from the north or south and perform bombing and strafing passes on a bombing circle or scored targets. The range, which permits low- and high-angle bombing, contains 11 tactical and strafe targets and is compatible with all high-speed jet aircraft (SAIC, 1998).

Camp Atterbury currently has 37 direct fire ranges, 29 of which are adjacent to and fire directly into the centrally located common impact area (SAIC, 1998). The remaining ranges are located throughout the seven major training areas. These ranges provide training and qualification firing for individual and crew-served weapon systems as well as antitank weapons, demolitions, helicopter gunnery, tank firing, and hand grenades. Appendix B provides a summary of the ranges of Camp Atterbury and the munitions used on each range. Camp Atterbury also supports indirect mortar and artillery live-fire training and service practice. There are 51 surveyed artillery firing points with the capability to support indirect fire from 105-mm through 203-mm cannons. Twenty mortar firing points support mounted and dismounted mortar training from 60-mm through 120-mm mortars, including three for 81-mm Short Range Training Round (SRTR) training. Five observation points that provide varying views of the common impact area. The 203-mm howitzer is being dropped from the Army weapons inventory; thus firing of the 203-mm no longer occurs at Camp Atterbury (SAIC, 1998).

Few, if any, lead projectiles are used during weapon live-fire training. While most larger weapons fire training practice (TP) rounds, some potential dud-producing high explosive (HE) rounds are fired. All major weapons systems fire into the common impact area. Small arms TP rounds are normally steel core with a copper jacket; mortar and artillery HE/smoke/illumination rounds are steel and brass. A limited number of small arms using 22-caliber and 9-mm rounds may contain lead projectiles (SAIC, 1998).

Nonfiring training facilities located on the installation include a medical litter course; a rappelling tower; a physical conditioning course; a nuclear, biological, chemical (NBC) chamber; the Still Water bridge and rafting site; the Mobile Conduct of Fire Trainer (M-COFT) site; a training set fire observation (TSFO) trainer; sling load trainers; land navigation courses; three Air Force-certified drop zones; and a 1,250-m tactical landing strip capable of supporting C-130 aircraft operations.

Training Materials

AN-M8 and M18 smoke grenades have been used at Camp Atterbury as part of regular training exercises to simulate realistic battlefield conditions. In 1998, Camp Atterbury conducted an Ecological Risk Assessment (ERA) (Montgomery Ward and 3D/I, 1998) as part of the environmental analysis to determine the impacts of the construction and operation of a multi-purpose training range (MPTR) on Indiana bats. The results of the ERA indicated that hexachloroethane (HC) found in smoke from the AN-M8 grenades may cause adverse toxicological effects on roosting and foraging Indiana bats. Concentrations of AN-M8 smoke that are unsafe for Indiana bats are produced by a single release and may disperse greater than 2 km from the release point. To avoid adverse toxicological effects on Indiana bats, Camp Atterbury is no longer using AN-M8 smoke grenades on the installation (Montgomery Watson and 3D/I, 1998).

The Army is currently using M18 smoke grenades containing terephthalic acid (TPA), as TPA is noncarcinogenic and its combustion products are less toxic than those of HC (Jones, 2000). In FY 01 Camp Atterbury used 1,384 M18 grenades, 986 of which were used from April to September for an average of six grenades per day. Smoke grenade usage is not confined to a specific area of the installation. It is currently not possible to determine locations in which the grenades were used, but once the MPTR is operational, locations of smoke grenade deployments within the MPTR will be recorded.

The MPTR ERA indicated that chemicals found in M18 colored smoke grenades may cause adverse toxicological effects. Indiana bats roosting within 36 m of the deployed grenade may inhale unsafe concentrations of M18 smoke during a one-minute period following release. Camp Atterbury has established a policy to avoid releasing M18 smoke grenades, regardless of color, to the maximum extent practical within 36 m of trees during the summer maternity roosting season, so that adverse toxicological effects to Indiana bats can be avoided (Montgomery Watson and 3D/I, 1998).

The Army also plans to begin using M83 smoke grenades and smoke pots and generators containing TPA. A BA addressing the effects on Indiana bats from the use of TPA smoke obscurants was conducted at Fort Leonard Wood (Harland Bartholomew and Associates, 1997). The BA assessed the effect of the maximum number of TPA grenades being released one at a time to determine the concentration of TPA at expected

exposure points. The following assumptions were used in the Fort Leonard Wood BA when calculating the exposure of receptors to TPA obscurants at Fort Leonard Wood:

TPA Smoke Grenades

- 131 training days per year
- 3,136 TPA grenades maximum per year
- 2,242 grenades from 1 November through 15 March (93 training days)
- 141 grenades maximum used daily at one or more of 22 training locations
- 24 grenades maximum per day from any one training location

TPA Smoke Pots

- 16 training days per year
- 950 smoke pots
- 59 smoke pots maximum used daily at one or more of 22 training locations

The dispersion and exposure models assumed a three minute burn time for both the grenades and the smoke pots. Some of the findings listed in the Fort Leonard Wood BA regarding the effects of TPA on the Indiana bat are as follows:

- Under worst-case atmospheric conditions, unsafe plumes disperse 90 to 120 m. Although the BA determined that a single exposure to smoke from a TPA obscurant may affect foraging and roosting Indiana bats within 90 m of the source, it conservatively estimates that acute inhalation effects from exposure to the maximum potential number of grenades and smoke pots listed above could affect fewer than 100 individual bats during the maternity season.

- The assessment of chronic effects evaluated worst-case exposure in that it was assumed that individual bats would be exposed to TPA each time it is released, regardless of wind direction. It was also assumed that the releases would occur during the portion of the year when bats are present on the installation. The BA assessed the effects of exposure to 3,136

grenades and 950 smoke pots. If actual exposures to a single bat are limited to 105 or fewer grenades or 107 or fewer smoke pots, there would be no chronic effects.

- Prey species are unlikely to be affected by exposure to TPA through aquatic pathways. The primary combustion products of TPA are carbon monoxide, carbon dioxide, sulfur dioxide, benzene, toluene, and formaldehyde. These compounds are released in a gaseous state. The 1998 Fort Leonard Wood Annual Report that followed up the Biological Opinion to the BA found that TPA biodegrades in water, particularly when microorganisms in the water adapt to the compound (BHE Environmental, 2000). Combustion products that do enter water systems will be rapidly degraded through photochemical reactions or through biodegradation.

As a result of the BA, Fort Leonard Wood is permitted to use M83 grenades during military training exercises with the limitation that any TPA obscurants released within 120 m of watercourses must occur during daylight hours (Harland Bartholomew and Associates, 1997). In addition, Camp Atterbury is monitoring annual reports produced by Fort Leonard Wood for the U.S. Fish and Wildlife Service (USFWS) as required by the terms and conditions in the Biological Opinion/Take Statement for the BA. The 2000 Fort Leonard Wood Annual Report concluded that the low concentrations of TPA in most bat samples, including those from reference sites, were potentially from a biogenic source or metabolic byproduct rather than inhalation of smoke from TPA grenades. The 2001 Fort Leonard Wood Annual Report summary is provided in Appendix C.

Camp Atterbury is proposing to integrate the use of the M83 grenades and smoke pots and generators into their current training activities. It is planned that a total of 500 M83 grenades will be used during military training exercises between 1 May and 30 September annually. This equates to a total of 153 training days and an average use of 3.3 grenades per day. The use of the grenades will not be concentrated in any one area; rather, their use will be scattered randomly at ranges across the installation. The proposed use of M83 grenades (three per day) plus the current use of M18 grenades (six per day) at Camp Atterbury will be considerably less than the current use of these grenades at Fort Leonard Wood (141 per day). The quantity of and locations for proposed use of smoke pots and generators are currently not available, but is expected

Table 3-2

Comparison of Current Use of M83 Smoke Grenades at Fort Leonard Wood with Proposed Use at Camp Atterbury

Installation	Maximum Number of Grenades Used/Day	Total Days Used/Year	Yearly Total Grenade Use	Location of Use
Fort Leonard Wood	141	131 days	3136	Used at 22 sites across the installation
Camp Atterbury	3	153 days	500	Installation-wide; use not concentrated at any specific site

to be less than the number of proposed grenades. Table 3-2 compares the proposed use of M83 grenades at Camp Atterbury to the current use at Fort Leonard Wood.

3.3 ANTICIPATED FUTURE MILITARY ACTIVITIES

It is likely that, over time, Camp Atterbury will experience an increase in the number of units using its training facilities and the intensity of training that will occur there. The MPTR, once complete, is likely to draw additional mechanized and light armored vehicle (LAV) use as well as rotary wing aircraft. Additional factors that are likely to result in an increase in the utilization of the facilities at Camp Atterbury include the following (INARNG, 1999):

- More training requirements based on combat support (CS) and combat service support (CSS) models.
- Increased demand for training facilities related to potential regional BRAC activities.
- Increased utilization from Active Component (AC) during weekday as combat arms (CA) training opportunities are identified.
- Greater use of school type courses as 138th Regiment (Combat Arms) increases the schools it operates.
- More training based on task force and/or strike force operations.

- Greater demand for Military Operating in Urban Terrain (MOUT)-type facilities.

Increased use of the training lands at Camp Atterbury can be expected to place further demands on the natural resources. The Natural Resources Branch is continuing to diligently monitor the environmental conditions and implement an adaptive ecosystem management approach.

SECTION 4.0:
SPECIES OF CONCERN

4.1 INDIANA BAT (Myotis sodalis)

This section provides an overview of the biological and ecological information on the Indiana bat, including its physical description, distribution, summer and winter habitat requirements, and life history, as well as reasons for its decline and conservation measures that are being taken by various agencies and organizations. In general, additional study is needed to further delineate this species distribution and further define its summer habitat requirements and the reasons for its decline. A summary of the Indiana bat's current status at Camp Atterbury is also presented.

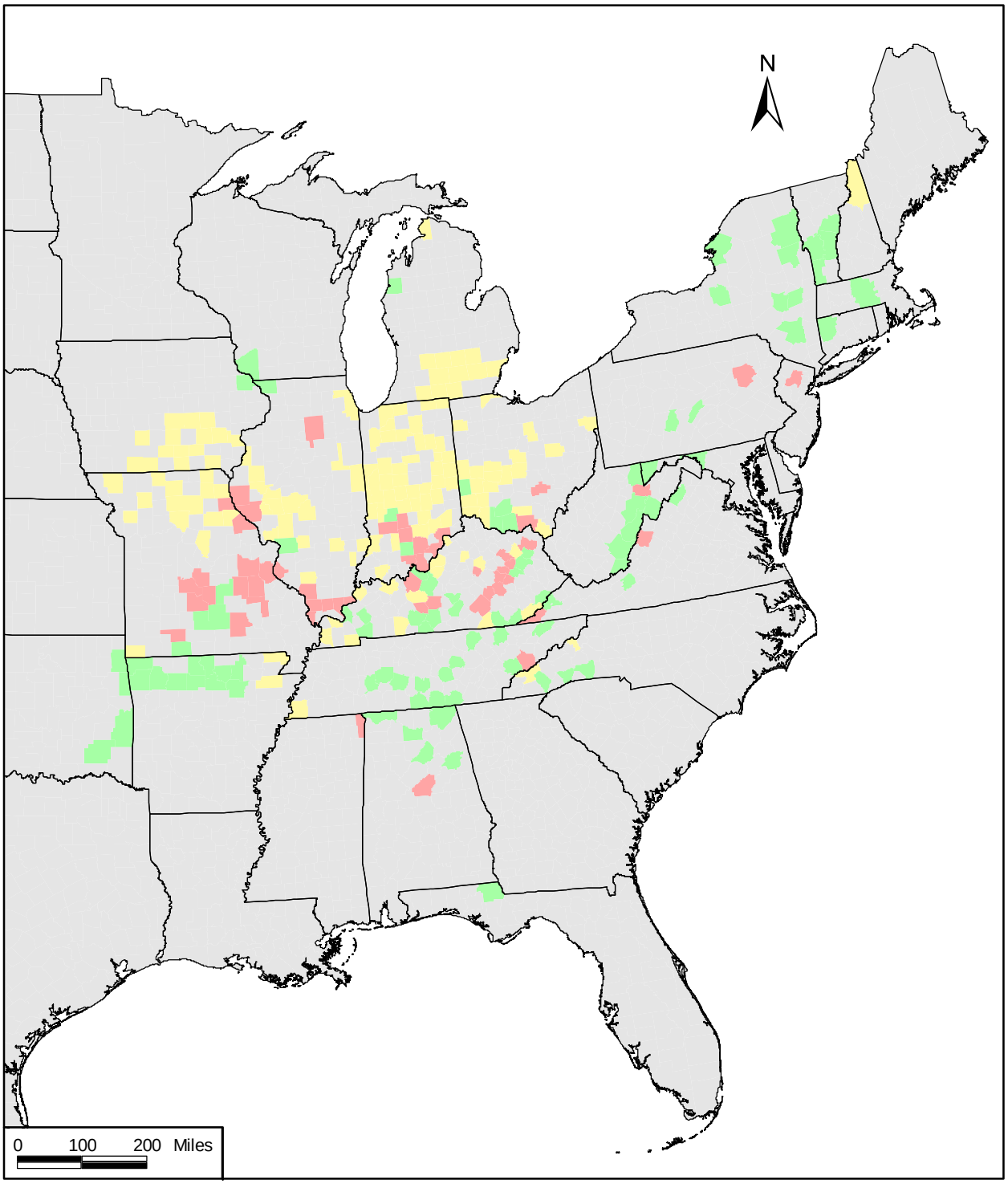
4.1.1 Physical Description

The Indiana bat is a small, brownish bat with blackish wings (Kurta, 1995). Dorsally, its fur is usually dull, dark pinkish-brown. Ventrally, the fur is slate-colored basally; has grayish-white tips; and is washed heavily with cinnamon brown, particularly at the flanks. The Indiana bat is similar in appearance to the little brown bat (*Myotis lucifugus*) and the northern long-eared bat (*Myotis septentrionalis*). The Indiana bat can be distinguished from these two species based on the following characteristics: (1) the Indiana bat has smaller feet and shorter hairs on its toes (the hairs do not extend beyond the toenails) and (2) the Indiana bat has a distinct keel on the calcar, a spur on the membrane between the foot and the tail (Mumford and Whitaker, 1982; Whitaker and Hamilton, 1998).

Male and female Indiana bats measure from 41.4 to 49.0 mm from head to tail and have a typical wingspan of 240 to 267 mm. The average weight of a female is 7.4 g; males are slightly smaller and average 7.1 g (Thomson, 1982).

4.1.2 Distribution

M. sodalis ranges in the eastern United States from Oklahoma, Iowa, and Wisconsin east to Vermont and south to northwestern Florida (Figure 4-1) (Barbour and Davis, 1969). However, the species is migratory,



LEGEND

- County with Indiana Bat Summer Record
- County with Indiana Bat Hibernacula
- County with Both Indiana Bat Hibernacula and Summer Record

Source: Montgomery Watson and 3D/I, 1998.

Range of the Indiana Bat
in the Eastern United States

Figure 4-1

and this range includes both summer and winter habitat. The winter range is associated with regions of well-developed limestone caverns. Major populations of Indiana bats hibernate in Indiana, Kentucky, and Missouri. Smaller populations are known from Alabama, Arkansas, Georgia, Illinois, Maryland, Mississippi, New York, North Carolina, Ohio, Oklahoma, Pennsylvania, Tennessee, Virginia, and West Virginia. Approximately 85 percent of the population hibernates in only seven caves, and nearly 50 percent may hibernate in only two caves (USFWS, 1999).

The known range of the Indiana bat includes all of Indiana. The largest known cave, or hibernacula, within the state is found approximately 60 km to the southwest of Camp Atterbury in Greene County. Indiana bats that had been banded at Camp Atterbury were documented in this Priority 1 hibernacula (supporting greater than 30,000 Indiana bats). Two other Priority 1 hibernacula are located in Harrison and Crawford Counties in extreme southern Indiana (USFWS, 2001).

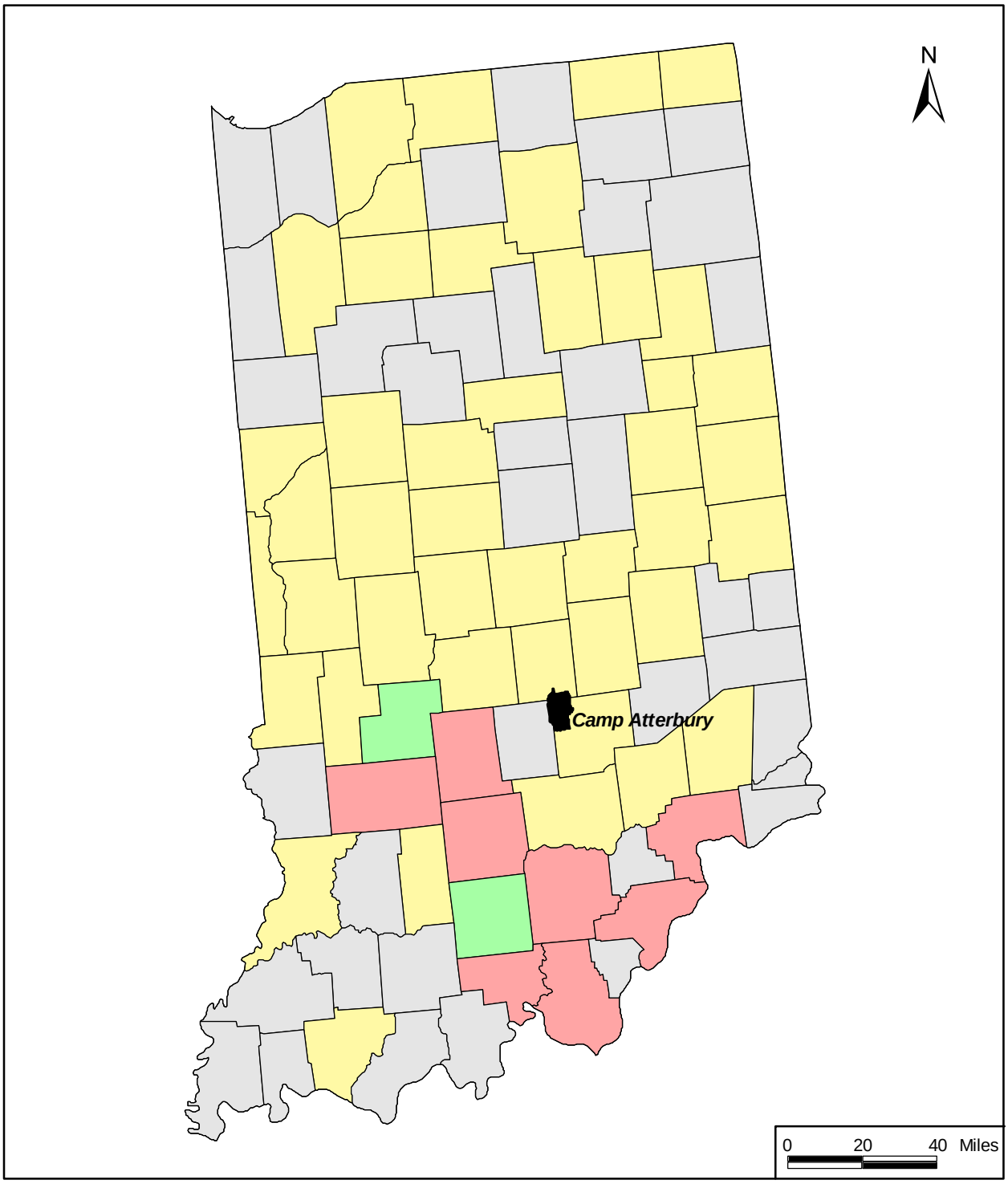
The closest known hibernacula to Camp Atterbury are two Priority 2 hibernacula (supporting 1,000 to 30,000 Indiana bats) in Monroe County, approximately 45 km west of Camp Atterbury. Another Priority 2 hibernacula is located farther west in Owen County (USFWS, 1999). Summer occurrences of Indiana bats are documented in 51 counties throughout Indiana (Figure 4-2).

4.1.3 Habitat Requirements

The Indiana bat requires the following two distinct types of habitat: (1) winter hibernation sites (hibernacula) and (2) summer roosting sites and foraging areas.

Winter Habitat. During the winter, the Indiana bat generally hibernates in caves, although abandoned mines have also been used. The Indiana bat favors walls and ceilings in portions of the hibernaculum where temperatures are 2 to 5 ^{o}C (33 to 42 ^{o}F), the relative humidity is 66 to 95 percent, and there is some air movement (Whitaker and Hamilton, 1998).

Summer Habitat. The summer habitat requirements of the Indiana bat are not completely understood (USFWS, 1999). Early research had shown that floodplains and riparian forests were the primary summer roosting and foraging habitats (Humphrey et al., 1977), but more recent work indicates that upland forests are used for roosting, and upland forests, old fields, and pastures with scattered trees provide foraging



LEGEND

- County with Indiana Bat Summer Record
- County with Indiana Bat Hibernacula
- County with Both Indiana Bat Hibernacula and Summer Record

Summer Occurrences of Indiana Bats

in Indiana Counties

Source: Montgomery Watson and 3D/I, 1998.

Figure 4-2

habitat (Callahan et al., 1997; Clark et al., 1987; Gardner et al., 1991a). Indiana bats have been known to live in highly altered landscapes and use an ephemeral resource (dead and dying trees) as roost sites. Maternity roosts have been located in areas where the overstory has been killed and the understory has been removed (USFWS, 1999). Indiana bats have been found roosting in shelterwood cuts in Kentucky (MacGregor, 1997). Maternity colonies have been known to move to another tree when their roost tree was cut down, indicating that the species is more adaptable than previously thought (USFWS, 1999). However, it is also known that Indiana bats exhibit fidelity to their summer home range, and the selection of a disturbed site for use by an Indiana bat maternity colony does not necessarily indicate a preference for disturbed sites or that the area provide high quality habitat. Potentially, it may just be an artifact of site fidelity (USFWS, 2001).

During the summer, the Indiana bat roosts beneath slabs of loose bark of trees in semiwooded areas in upland and bottomland forests or in open areas (Kurta et al., 1993). Important roost tree characteristics include the tree's (1) condition (dead or alive), (2) species, (3) diameter, (4) solar exposure and location in relation to other trees, (5) proximity to water sources and foraging areas, and (6) quantity of exfoliating bark (Rommé et al., 1995). The most suitable roost sites are beneath the exfoliating bark of dead trees where there is adequate space for air to circulate and for bats to change their position on the trunk (Garner and Gardner, 1992). Table 4-1 presents tree species identified as having relatively high value as potential roost trees for the Indiana bat. These trees typically exhibit exfoliating bark when they are senescent, severely injured, or dead. The Indiana bat has also been observed roosting in hollow portions of tree trunks and limbs and in cavities (seams and splits) in lightning struck and damaged trees (Kurta et al., 1993).

The Indiana bat has been observed to occupy two types of maternity roosts, primary and alternate (Callahan et al., 1997). Primary maternity roosts are those used by more than 30 bats on more than one occasion; all other roosts are considered to be alternate maternity roosts. Differences in patterns of use between the type of maternity roosts are apparently influenced by weather conditions, with increased use of alternate maternity roost trees during periods of elevated temperatures and precipitation. Live shagbark hickories have been identified as exhibiting favorable temperatures for roosting bats during cool periods because of their greater thermal mass, and effective protection from precipitation because of the structural characteristics of their bark (Humphrey et al., 1977).

Table 4-1

Potential Indiana Bat Roost Trees

Common Name	Scientific Name
Silver maple	*Acer saccharinum*
Shagbark hickory	*Carya ovata*
Shellbark hickory	*C. laciniosa*
Bitternut hickory	*C. coridiformis*
Green ash	*Fraxinus pennsylvanica*
White ash	*F. americana*
Eastern cottonwood	*Populus deltoides*
Northern red oak	*Quercus rubra*
Post oak	*Q. stellata*
White oak	*Q. alba*
Shingle oak	*Q. imbricaria*
Slippery elm	*Ulmus rubra*
American elm	*U. americana*
Sassafras	*Sassafras albidum*
Sugar maple	*A. saccharum*
Black locust	*Robinia pseudoacacia*

Source: USFWS, 1998.

A maternity colony of Indiana bats requires a large number of roost trees which provide a variety of roosting conditions. Research has demonstrated that most maternity roost colonies use in excess of four roost trees during a single season. Indiana bat maternity colonies generally consist of one or more primary maternity roost trees which are used repeatedly by large numbers of bats, and varying numbers of alternate roosts, which may be used less frequently by fewer bats (USFWS, 1999). One colony on Camp Atterbury used two primary roosts and nine alternate roosts, with the primary roosts used by more than 30 bats on more than one occasion. According to another study conducted in central Indiana in 1999, one maternity colony used a minimum of one primary and 12 alternate roosts (USFWS, 2001). Switching roosts may protect Indiana bats from harsh weather conditions (Gardner et al., 1991b; Callahan et al.; 1997). One study observed that the radius of the smallest circle that would encompass all roost trees for each colony ranged from 0.5 to 0.9 mi (Callahan et al., 1997). Primary maternity roost trees have been observed to range in size from 12.2 to 29.9 inches diameter at breast height (dbh) (Callahan, 1993). Alternate maternity roost trees range in size from 7.1 to 43.3 inches dbh (Garner and Gardner, 1992; Callahan et al., 1997).

Because Indiana bat roosts are typically formed in dead or dying trees, roosts are often ephemeral. Most roost trees may be habitable for only 2 to 8 years (depending on the species and condition of the roost tree) under natural conditions. Gardner et al. (1991b) evaluated 39 roost trees and found that 31 percent were no longer suitable the following summer and 33 percent of those remaining were unavailable by the second summer. Large, nearby forest tracts increase the chances that a suitable range of necessary roost trees will be present in order for a maternity roost colony to thrive (USFWS, 1997).

The Indiana bat forages in upland, floodplain, and riparian forested areas. Tree species within these areas around which the bat has been observed to feed include the American sycamore (*Platanus occidentalis*), eastern cottonwood (*Populus deltoides*), green ash (*Fraxinus pennsylvanica*), box elder (*Acer negundo*), silver maple (*Acer saccharinum*), river birch (*Betula nigra*), northern hackberry (*Celtis occidentalis*), black walnut (*Juglans nigra*), black willow (*Salix nigra*), and oak (*Quercus* sp.) (Humphrey et al., 1977; USFWS, 1997). Streams, associated floodplain forests, and impounded bodies of water are the preferred foraging habitat for the Indiana bat. The Indiana bat also forages within the canopy of upland forests, in clearings, along the borders of croplands, along wooded fencerows, and over farm ponds in pastures (Clark et al., 1987; Gardner et al., 1991b). The Indiana bat usually forages and flies from 2 to 30 m above ground level (Humphrey et al., 1977). The distance between maternity roosts and the geometric center of foraging areas used by pregnant Indiana bats has been observed to average 1.1 km (Garner and Gardner, 1992) and to extend up to 5 km (Whitaker and Hamilton, 1998).

4.1.4 Life History

The Indiana bat annually repeats a cycle of six life history events: (1) a spring "staging" period upon its emergence from hibernation, (2) spring migration, (3) summer birthing, (4) fall migration, (5) fall "swarming" prior to hibernation, and (6) hibernation.

The Indiana bat emerges from hibernation in April and May and engages in spring staging before migrating to its summer habitat. During the staging period, the bats begin their feeding forays, and some copulation may also occur (Whitaker and Hamilton, 1998). Female Indiana bats enter the staging period in mid-April while most males remain in hibernation. Females leave the hibernacula and begin migration by early May; most males leave the hibernacula by mid-May (Cope and Humphrey, 1977).

Spring migration is generally northward, with the bats flying up to several hundred km (Whitaker and Hamilton, 1998). Females segregate from males in the summer, forming small maternity colonies at roosting sites (Humphrey et al., 1977). Males and nonbreeding females form separate, small colonies, apart from pregnant females (Whitaker and Hamilton, 1998). Because Indiana bats exhibit strong site fidelity to their summer roosting and foraging habitat, traditional summer sites are essential to the reproductive success of local populations (Humphrey et al., 1977). In general, the maternity roosting season occurs between 15 April and 15 September.

Female Indiana bats give birth in late June or early July after they have grouped into maternity colonies (USFWS, 1983). Each female Indiana bat usually bears one offspring per year, although two offspring have occasionally been reported (Cope and Humphrey, 1977). After the young are born, maternity colonies can consist of as many as 384 bats (Montgomery Watson, 1999). Young Indiana bats are volant, or capable of flight, within a month of their birth. Early-born young may be flying as early as the first week of July (Clark et al., 1987); however, most probably begin flying from mid to late July. After the young bats gain their independence, migration back to the hibernacula begins; the males tend to precede the females (Whitaker and Hamilton, 1998). Females can live at least 15 years, and males live at least 14 years (Humphrey et al., 1977).

Migrating Indiana bats begin to arrive at their hibernacula in August. Males arrive first, and females begin arriving in late August. By September, the numbers of males and females arriving are about equal (Montgomery Watson and 3D/I, 1998). The number of bats arriving at the hibernacula peaks in September and October (Whitaker and Hamilton, 1998).

Upon arriving at the hibernacula, the Indiana bat engages in a behavior known as fall swarming. Swarming is characterized by large numbers of Indiana bats coming together in a mating frenzy at the entrances of hibernacula before hibernating. Sperm is transferred to the female during swarming, but ovulation and fertilization of the egg are delayed until after the end of hibernation in the spring. By late September, many females begin hibernation, and swarming bats are predominantly male. Males continue swarming until mid-October or later in an apparent effort to breed with late-arriving females (Cope and Humphrey, 1977).

In general, the Indiana bat hibernates from October through April, depending on local weather conditions (Hall 1962; LaVal and LaVal, 1980). Both sexes are found in hibernating groups, usually in tightly packed

clusters of 300 to 350 bats per square foot on walls and ceilings (Hofmann, 1996). They are often clustered to the extent that only the faces, ears, and wrists show (Whitaker and Hamilton, 1998).

When the Indiana bat is not hibernating, it is nocturnal, usually foraging for 1 or 2 hours after sunset and before sunrise (Hofmann, 1996). Clark et al. (1987) report mist netting Indiana bats as early as 14 minutes after sunset and as late as 22 minutes before sunrise. The Indiana bat's diet primarily consists of small, soft-bodied insects such as moths and flies, including small moths (Lepidoptera), flies (Diptera), caddis flies (Trichoptera), bees and wasps (Hymenoptera), beetles (Coleoptera), true bugs (Hemiptera), stoneflies (Plecoptera), and lace wings (Neuroptera) (Brack and LaVal, 1985; Whitaker and Hamilton, 1998). Prey are eaten during flight. The Indiana bat locates insects using echolocation, during which the bat emits high-frequency sound waves that bounce off potential prey. From the speed and direction of the returning sound waves, the bat can determine the location, the size, and potentially the identity of insects (Ohio Division of Wildlife, 1996).

4.1.5 Reasons for Decline

Based on censuses taken at hibernation sites, the total known population of the Indiana bat is estimated to have declined from 550,000 in 1980 and 1981 to 352,000 in 1997. Researchers have attributed the overall decline of the Indiana bat population primarily to direct and indirect actions of humans and to natural hazards. Human causes of the population decline include (1) hibernaculum disturbance and vandalism, (2) loss of forest cover, and potentially (3) pesticide poisoning. Recreational cave explorers and researchers who disturbed hibernacula were believed to cause bats to exhaust their limited fat reserves before spring, resulting in mortality. Vandalism and destruction of hibernacula and their occupants have also been documented (USFWS, 1983). Loss of forest cover through tree removal or land clearing for agriculture, surface strip mining, road and utility construction, and other forms of development has adversely affected the Indiana bat throughout its range. Although pesticide-related mortality has not been documented for the Indiana bat, several researchers regard agricultural pesticides as a possible cause of the decline in this species in certain regions (Evans et al., 1998; Garner and Gardner, 1992). Natural hazards, such as cave flooding, cave ceiling collapse, and severe weather, have also resulted in destruction of Indiana bat habitat and in bat mortality (USFWS, 1983). The fact that the Indiana bat hibernates in large clusters in a few caves makes it especially vulnerable; an extreme disturbance can destroy a significant percentage of the total species

population (Mumford and Whitaker, 1982; Whitaker and Gammon, 1988). Another contributing factor may be that fecundity is low, as female Indiana bats produce only one young per year (USFWS, 1998).

4.1.6 Conservation Measures

The Indiana bat was first listed as a federal endangered species throughout its range on 11 March 1967 (32 FR 4001) under the Endangered Species Preservation Act of 1966 (80 stat. 926: 16 U.S.C. 668aa[c]). A recovery plan for the Indiana bat was developed by a USFWS-sponsored recovery team (USFWS, 1983). The recovery plan established the following goals to meet the primary objective of removing the Indiana bat from its endangered status:

- Preventing disturbance to hibernacula
- Maintaining, protecting, and restoring foraging and summer maternity roost habitat
- Monitoring population trends; educating the public
- Conducting research

The Indiana bat recovery plan is currently under revision, and a draft of that document has been released for public review (USFWS, 1999). The revised recovery actions for addressing threats to the Indiana bat, as provided in the draft 1999 recovery plan, are as follows:

- Conduct research necessary for the survival and recovery of the Indiana bat
- Obtain information on population distribution, status, and trends
- Protect and maintain Indiana bat populations
- Provide information and technical assistance outreach.
- Coordinate and implement the conservation and recovery of the Indiana bat.

To date, conservation efforts have primarily featured protection of hibernacula and research into the life history of the Indiana bat. On 24 September 1976, the 11 caves and two mines listed in Table 4-2 were designated as "critical" habitat for the Indiana bat (41 (187) FR). Critical habitat is defined as being essential to the conservation of the species and requiring special management considerations or protection (USFWS and NMFS, 1998).

No other hibernacula have been added to the list since 24 September 1976. Nevertheless, state and federal agencies have acquired several Indiana bat hibernacula for protection purposes; for example, 54 of the 127 caves and mines (43 percent) with populations of more than 100 bats are publicly owned, and 46 caves (36 percent), most of which are on public land, are gated or fenced (USFWS, 1999).

Table 4-2
Designated Critical Habitat for the Indiana Bat

Hibernacula	County	State
Big Wyandotte Cave	Crawford	Indiana
Ray's Cave	Green	Indiana
Blackball Mine	LaSalle	Illinois
Bat Cave	Carter	Kentucky
Coach Cave	Edmonson	Kentucky
Cave 021	Crawford	Missouri
Cave 009	Franklin	Missouri
Cave 017	Franklin	Missouri
Bat Cave	Shannon	Missouri
Cave 029	Washington	Missouri
Pilot Knob Mine	Iron	Missouri
White Oak Blowhole Cave	Blount	Tennessee
Hellhole Cave	Pendleton	West Virginia

Source: 41 (187) FR.

Currently, data are insufficient to conclude whether availability of summer habitat is limiting Indiana bat recovery. Until such information is obtained, conservation measures include continued research on the summer habitat needs of the Indiana bat and a conservative approach during evaluation of the potential effects of land use practices on summer habitat.

Varying population trends throughout the range of the Indiana bat suggest that the protective measures taken to date have not resulted in the recovery of the species. Therefore, the USFWS is currently revising its recovery plan for the Indiana bat.

4.2 INDIANA BATS ON CAMP ATTERBURY

4.2.1 Previous Bat Surveys

A report of vertebrate fauna on Camp Atterbury by the Indiana Department of Natural Resources (IDNR) (1991) stated that Indiana bats were undoubtedly present on Camp Atterbury, although no *M. sodalis* were collected for the survey. Collection methods may have influenced the results of the survey, however, as the level of effort, sampling locations, and survey dates were not reported. Prior to 1997, the presence of Indiana bats on Camp Atterbury had not been documented (Montgomery Watson and 3D/I, 1998).

Prior to recent surveys in southern Indiana, it was known that adult male Indiana bats could be found throughout the state in the summer, but it was unclear if maternity colonies of Indiana bats were present. Summer records of reproductive female or juvenile Indiana bats provide evidence of a nearby maternity colony. There are relatively few records of reproductive female Indiana bats or juveniles from the cave region of Indiana during the summer (Brack, 1983; Brack et al., 1987); however, the number of records is growing (USFWS, 1998).

In August 1997, a mist net survey was conducted on Camp Atterbury to investigate the presence and distribution of Indiana bats. Eight species of bats were captured during the survey, including the northern long-eared bat (*Myotis septentrionalis*), little brown bat (*M. lucifugus*), evening bat (*Nycticeius humeralis*), big brown bat (*Eptesicus fuscus*), red bat (*Lasiurus borealis*), hoary bat (*L. cinereus*), eastern pipistrelle (*Pipistrellus subflavus*), and the Indiana bat (*M. sodalis*) (Montgomery Watson and 3D/I, 1998). Thirteen *M. sodalis*, including two reproductive females and eight juveniles, were captured from 9 of the 22 sites surveyed (Figure 4-3). Capture of reproductive females and juveniles indicates maternity colonies are

located within approximately 2.5 km (1.5 mi) of the capture site (Gardner et al., 1991b). The number and distribution of reproductive females and juveniles captured suggested that a minimum of five Indiana bat maternity colonies are widely distributed across the installation (3D/I, 1997).

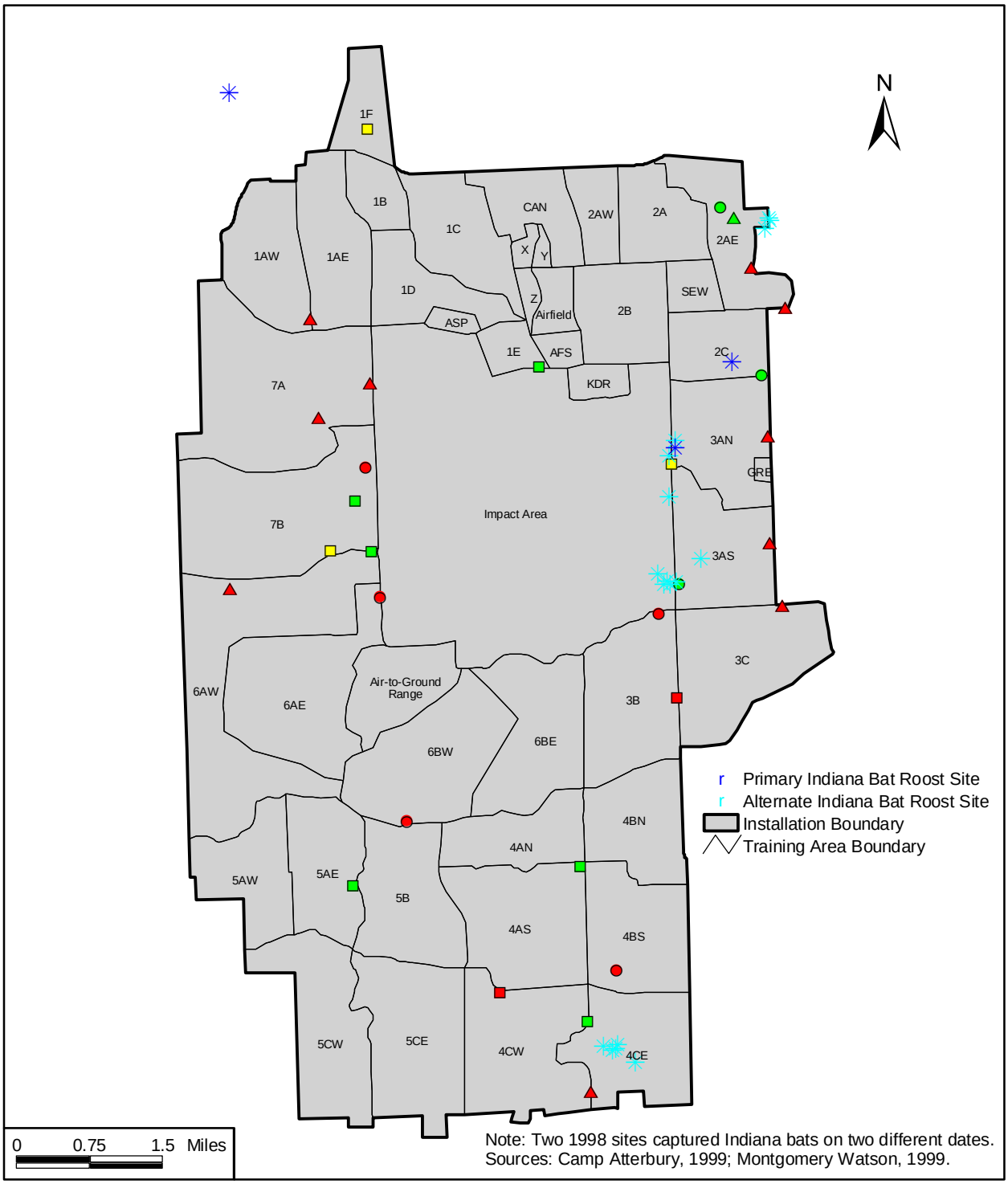
An additional mist net survey was conducted in 1998 that included a total of 31 nights of sampling at 17 sites located to the north, south, and east of the impact area. A total of 196 bats were captured during the survey and Indiana bats made up 12 percent (23 individuals) of the captures. Indiana bats were captured at 7 of the 17 sites (Figure 4-3), and only one or two individuals were captured at five of those sites. However, nine Indiana bats were captured at a site located in a nonriparian bivouac area, and eight bats were collected at the Mauxferry Road bridge over Ninevah Creek (Montgomery Watson, 1999).

Seven bridges on the installation were also sampled to determine whether Indiana bats used these bridges as roosts during nighttime foraging events. A total of 44 Indiana bats were found under the bridges over Sugar, Nineveh, and Catherine Creeks. Mauxferry Road bridge over Nineveh Creek and Hospital Road bridge over Sugar Creek were the bridges most frequently used by Indiana bats. Indiana bats were found at these three bridges each time they were checked (Montgomery Watson, 1999).

Seven Indiana bats were fitted with radio transmitters and tracked to their roost trees. Three primary roost trees and 17 alternate roost trees were located during the radio tracking. One of the primary roost trees is located 1.8 km northwest of the installation. Nine species of trees were used as roost trees, but the eastern cottonwood and American elm were the first and second most commonly used roost trees, respectively. The three primary roost trees consisted of two dead eastern cottonwoods and one dead American elm located in bottomland habitat. Excluding two live shagbark hickory trees that were used by a male Indiana bat, all of the roost trees that were identified during this study were dead. All 20 roost trees, with the exception of one alternate roost tree, were located within 120 m of open water (either stream or pond) (Montgomery Watson, 1999).

4.2.2 Indiana Bat Conservation and Protection Measures

The 1998 BA for the construction and operation of the proposed Multi-Purpose Training Range (MPTR) described Project Design Features (PDFs) that were developed specifically to avoid or minimize impacts of



Bat Mist Net Sites and Indiana Bat Roosts

LEGEND

△ Bat Mist Net Site (1997 Survey)
○ Bat Mist Net Site (1998 Survey)
□ Bat Mist Net Site Used Both in 1997 and 1998

Indiana Bats Captured in 1997 or 1998
Indiana Bats Captured in 1997 and 1998
No Indiana Bats Captured in 1997 or 1998

Camp Atterbury
Edinburgh, Indiana

Figure 4-3

the MPTR on the summer maternity habitat of the Indiana bat. The PDFs from the BA included the creation of bat management zones, development of a landscape-scale forest management policy, conduction of a bat radiotelemetry survey, and development of environmental awareness briefing and training materials for the military personnel and units that use Camp Atterbury (Montgomery Watson and 3D/I, 1998). Those PDFs have been incorporated into Camp Atterbury's Endangered Species Management Plan (ESMP) and INRMP (Tetra Tech, 2001). Management measures that are proposed to protect and enhance the Indiana bat habitat found on Camp Atterbury are habitat conservation and protection, monitoring, and environmental awareness.

Indiana bat conservation and protection measures include habitat protection and enhancement, monitoring, and environmental awareness. Habitat protection and enhancement measures include forest management, designation of Indiana bat management zones, imposition of restrictions on training materials, development of guidelines for pesticide use, development of sediment control measures, proper management of training and mission-related activities and construction and demolition projects to reduce the effects on the Indiana bat, and submission of an annual report to the USFWS outlining the status of Indiana bat habitat protection. These management measures are described below.

4.2.2.1 Habitat Protection and Enhancement

Forest Management

The goals of the forestry program at Camp Atterbury are to maintain the forest cover required for military training, maintain ecosystem viability, and provide for the production of commercial forest products. Endangered Species Act (ESA) Section 7 Consultation will be conducted with the USFWS to ensure that Indiana bat habitat protection and enhancement occur while achieving these goals. The Indiana bat uses the bottomland, riparian, and upland forests of Camp Atterbury for foraging and roosting during the summer. Maintaining the ecological integrity of these forested uplands and riparian corridors, the aquatic macroinvertebrate communities, and water quality is paramount to ensuring the long-term capability of the habitat to support this species.

As outlined in the INRMP and ESMP, Camp Atterbury's forest management program will implement the following management measures to ensure protection of the Indiana bat:

- Timber harvest and Timber Stand Improvement (TSI) activities will be conducted within guidelines agreed to under ESA Section 7 Consultation with the U.S. Fish and Wildlife Service to practically enhance Indiana bat habitat within the timber harvest area. Timber management activities within the Indiana Bat Management Zones (IBMZs) will be limited to activities designed to promote growth of a mature forest with an open understory (see below for further discussion on IBMZs). Figure 4-4 shows the locations of these and other types of management areas.

- The forestry program will adhere to the *Bloomington Field Office Indiana Bat Management Guidelines* as presented below and provided in Appendix D. These guidelines have been developed and approved by USFWS. The guidelines are designed to avoid take of Indiana bats associated with forest management activities. For activities that cannot be conducted within the scope of this guidance, additional consultation with USFWS will be required.

  - At least 60 percent canopy (on a stand-by-stand basis, depending on the size of the stand) must be maintained after any timber harvest activity.

  - Shagbark hickory (*Carya ovata*) or shellbark hickory (*Carya laciniosa*) trees shall not be harvested or manipulated during timber stand improvement (TSI) activities unless the density of trees of these two species combined exceeds 16 trees per acre. If present, at least 16 live shagbark and shellbark hickory trees (combined) greater than 11 inches dbh must be maintained per acre.

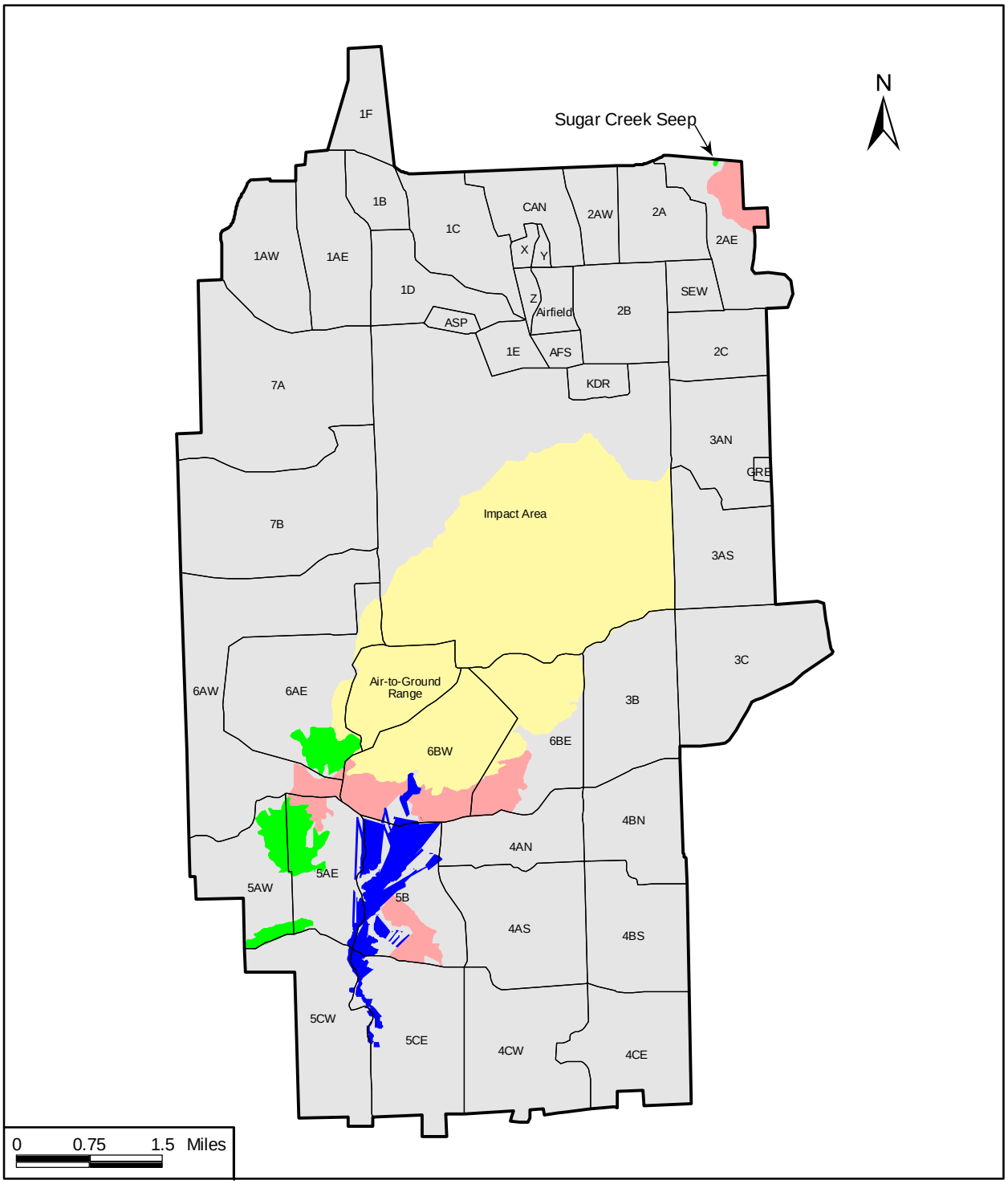
  - Snag removal is not permitted, except where they pose a hazard to human safety.

  - In addition to shagbark and shellbark hickory, the following species of trees have been identified as having relatively high value as potential Indiana bat roost trees:

    Bitternut hickory (*Carya cordiformis*)

    Silver maple (*Acer saccharinum*)

    Green ash (*Fraxinus pennsylvanica*)



LEGEND

- Special Management Area (Old Growth Area)
- Indiana Bat Management Zone
- Natural Area
- Multi-Purpose Training Range
- Installation Boundary
- Training Area Boundary

Source: Camp Atterbury, 1999.

Special Management Areas

Camp Atterbury
Edinburg, Indiana

Figure 4-4

White ash (*F. americana*)

Eastern cottonwood (*Populus deltoides*)

Northern red oak (*Quercus rubra*)

Post oak (*Q. stellata*)

White oak (*Q. alba*)

Slippery elm (*Ulmus rubra*)

American elm (*U. americana*)

Black locust (*Robinia pseudoacacia*)

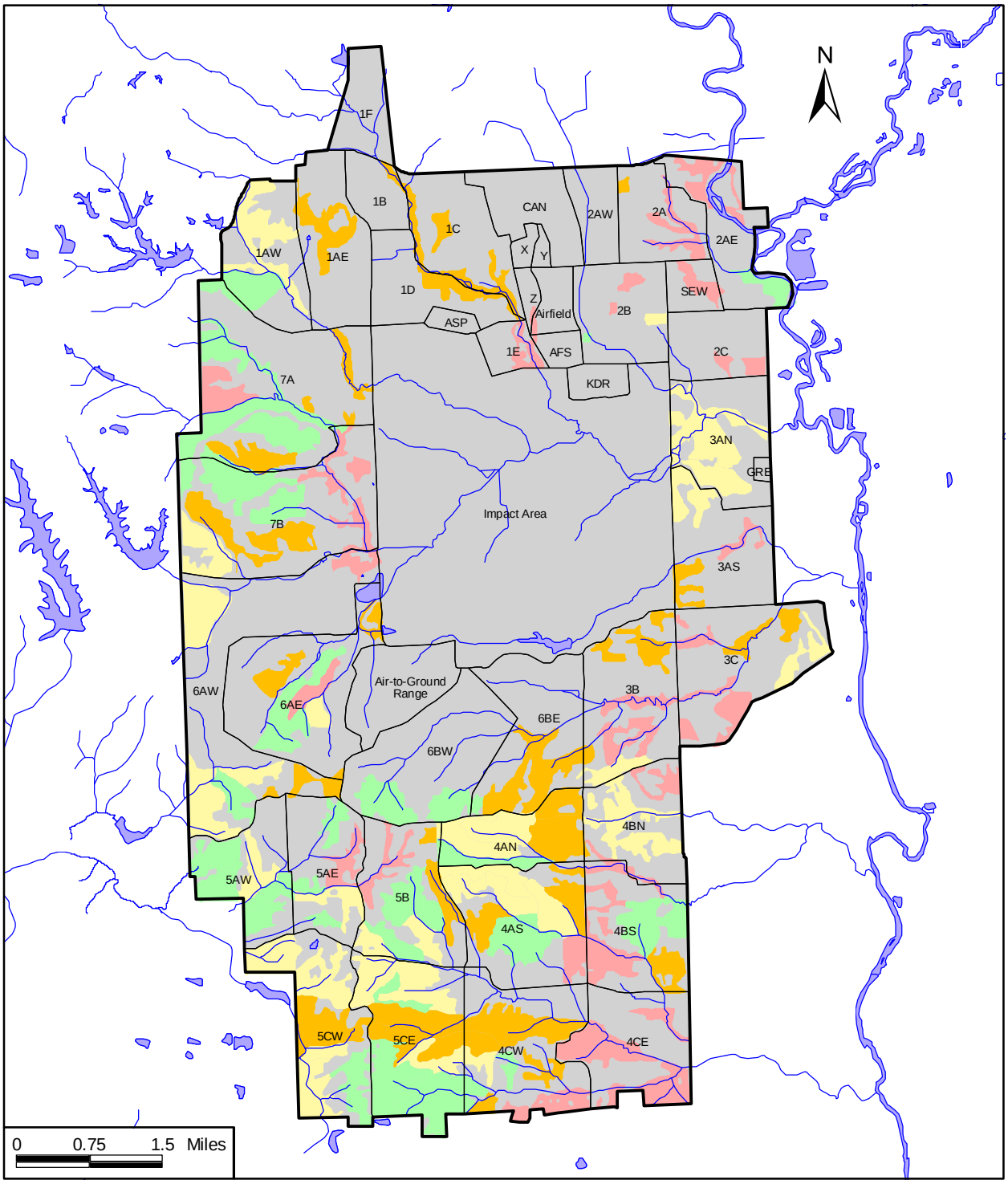
The distribution and abundance of potential Indiana bat roosting trees is provided in Figure 4-5.

At least three live trees (of the species listed above) greater than 20 inches dbh per acre should always be maintained in the stand. (A tree with less than 10 percent live canopy should be considered a snag.) These should be the largest trees of these species remaining in the stand.

An additional six live trees (of the species listed above) greater than 11 inches dbh per acre should also be maintained. (The "per acre" requirement can be expressed as the average per acre on a stand-wide basis, depending on the definition of a stand.)

If there are no trees greater than 20 inches dbh to leave, then 16 live trees per acre should be left, and these should include the largest specimens of the preferred species remaining in the stand.

[***NOTE:*** *The objective of these "leave tree" restrictions is to maintain a component of large, overmature trees in the stand. These trees are a valuable component of Indiana bat habitat. During two managed timber harvests on*



Density of Potential Indiana Bat Roosting Trees

LEGEND

Installation Boundary

Training Area Boundary

Number of Potential Indiana Bat Roosting Trees per Acre

16.0 - 57.0

57.0 - 76.1

76.1 - 109.4

109.4 - 251.2

Does not contain significant stands of potential Indiana bat trees

Source: Camp Atterbury, 1999.

Camp Atterbury
Edinburgh, Indiana

Figure 4-5

Camp Atterbury in 2001, the requirement of leaving the three largest trees were practically impossible to implement. There is flexibility in these "leave tree" restrictions if it can be demonstrated that the same objective can be achieved in a manner more easily incorporated into the forestry program. The USFWS Bloomington Field Office (BFO) approved the marking for these two harvests, with the condition that Camp Atterbury submit suggestions to rectify this for future general training area timber harvesting (MDI, 2001).]

- Generally, no harvest or TSI activities will occur within 100 ft on both sides of a perennial stream and within 50 ft on both sides of an intermittent stream.However, the selective removal of trees of high commercial value (e.g., black walnut) and the conduct of specific and limited TSI activities (e.g., girdling of specific cottonwood trees to release specific black walnut trees) may be done, on a case-by-case basis, in conjunction with informal consultation with USFWS.

- Generally, no scheduled timber harvests will be conducted during the Indiana bat reproductive season, which runs from April 15 to September 15.

- Riparian buffers will be 100 ft on each side of a perennial (USGS designated blueline) stream and 50 ft on each side of an intermittent (USGS designated dashed blueline) stream. The Indiana Forestry Best Management Practices (BMPs) for Riparian Management Zones (RMZs) (IDNR, 1998) will be implemented at sites where the suggested RMZ is greater than 100 ft (or 50 ft for intermittent streams).

- Current and future Indiana bat survey results will be mapped using geographic information systems (GIS) to indicate the area of potential bat colony sites (see Figure 4-3). When identified, these sites will be avoided, and when possible, activities will be undertaken to improve or enhance the maternity conditions of these sites.

Indiana Bat Management Zones (IBMZs)

To offset the potential habitat loss from the construction of the MPTR, Camp Atterbury has set aside four stands that total 777 acres, of which 539 acres are forested, as Indiana Bat Management Zones (see Figure 4-4). These forested stands consist of mature and early successional forest and areas vegetated with shrubs and grasses.

The IBMZs will be managed to provide the following habitat characteristics suitable for summering Indiana bats (Rommé et al., 1995):

- Closed canopy (at least 60 percent)
- Open understory,
- Presence of large diameter overstory trees
- Presence of potential roost trees

Three ponds were planned for construction within the IBMZs to provide water to improve bat habitat. One has been completed and is currently holding water, and the other two are scheduled to be completed in FY 02 (MDI, 2001).

The Indiana bat habitat quality of the IBMZs must be evaluated every three years. The outcome of the evaluation will be included in a report submitted annually to the USFWS (discussed in detail at the end of this section). Using the results of the evaluation, Camp Atterbury and the USFWS will cooperatively develop management prescriptions to be implemented for the IBMZs. Any management activities will be listed in the annual report. Management measures that will be considered for implementation in the IBMZs include the following:

- Timber harvest and TSI activities will be limited to activities designed to promote the growth of a mature forest with an open understory. These activities are as follows:
  - Thinning trees with a dbh of less than seven inches

  - Removing understory vegetation (shrubs, seedlings, exotic species, and vines growing from the base of overstory canopy down to 2 m above ground) in stands where understory vegetation cover exceeds 40 percent

- None of these activities are to occur between 15 April and 15 September.

- No silvicultural activities will be conducted on trees with dbh greater than seven inches.

- Snags (trees with less than 10 percent live growth) will not be removed unless they pose a safety hazard to the soldiers.

- The IBMZs will be incorporated into the Indiana bat monitoring program (described in Section 4.2.2.2). The results of the monitoring program should provide valuable information for evaluating the benefits of the silvicultural activities in the IBMZs to Indiana bats at Camp Atterbury.

- Military activities within the IBMZs will remain at current levels and will primarily consist of foot travel, bivouac activities, and surface danger zones associated with existing ranges and the MPTR.

- Tracked vehicles are restricted to existing trails and roads; off-road maneuvers with other vehicles will be minimized in the IBMZs.

Training Material Restrictions

The 1998 MPTR ecological risk assessment indicated that some of the currently used training materials including M18 smoke grenades could potentially cause toxic effects on Indiana bats (Montgomery Watson and 3D/I, 1998). As a result of those findings, Camp Atterbury will implement the following restrictions:

- Items containing hexachloroethane (HC) smoke (such as AN-M8 grenades) will no longer be used.

- Studies conducted by Fort Leonard Wood assessing the toxicity levels produced by TPA obscurants and their effects on Indiana bats will be monitored. If detectable amounts of TPA or lung damage are noted in samples collected at Fort Leonard Wood, but not in samples collected at reference sites, Camp Atterbury shall initiate an investigation to assess the potential for M18 smoke grenades to cause injury to Indiana bats at Camp Atterbury. In the interim, the release of M18 smoke grenades within 36 m of trees will be avoided to the maximum extent practicable between 15 April and 15 September.

- The installation must consult with USFWS on a case-by-case basis each time an activity involving the use of M83 grenades or TPA smoke pots or generators is planned. Consultation with the USFWS for these activities as a group and considered on a programmatic level would largely eliminate the need for consultation on a case-by-case basis. Through this biological assessment, Camp Atterbury is in the process of initiating Section 7 consultation with the USFWS regarding the impacts of ongoing training activities on the Indiana bat.

Camp Atterbury will continue to include in the annual report to the USFWS details of the use of M18 grenades, including the number of M18 grenades deployed during the year and during the period between 15 April and 15 September. The FY 1999, 2000, and 2001 annual reports submitted by Camp Atterbury to the USFWS BFO are provided in Appendix C.

Guidelines and Restrictions for Pesticide Use

Pesticides used in the cantonment area and on the ranges were glyphosate, malathion, chlorpyrifos, copper sulfate (algaecide), termiticides, and flea and other pest treatments. To avoid toxicological effects from pesticide use, Camp Atterbury will implement the following guidelines:

- The use of pesticides will be in accordance with directions provided by the manufacturer. This includes, but is not limited to, mixing instructions, application guidelines, storage requirements, and disposal guidelines.

- Pesticides will not be applied directly into waterbodies, nor be applied in a manner that might result in runoff (within 24 hours of rainfall) or drift into waterbodies, unless indicated as appropriate on the pesticide label or in the instructions.

In 2001, no pesticides were used on the MPTR, in Bat Management Zones, or near known bat roosting areas. No pesticides were used within 100 feet of a stream unless permitted on the label (such as glyphosate). No insecticides were used outside of the cantonment area. Personal protection pesticides such as OFF and personal troop fogging generators were used in training areas. Troops were instructed not to use these within 100 feet of any trees or streams.

A pesticide use summary characterizing pesticide applications, including types, amounts, locations and dates of applications, and habitats affected by applications (e.g., standing water, grasses, etc.), will continue to be submitted in the annual report to the USFWS BFO (See Appendix C).

Sediment Erosion Control Measures

Erosion control measures will be implemented during construction of the proposed MPTR and associated structures, such as access roads and buildings (Montgomery Watson and 3D/I, 1998). These measures are designed to protect water and aquatic habitat quality by minimizing sediment loading to the streams. Indiana bats forage on emergent aquatic insects, and degradation of water quality or aquatic habitat has the potential to adversely affect their food supply. Standard erosion control measures that will be implemented during construction of the proposed MPTR include the following:

- Vegetative and structural erosion practices will be constructed and maintained according to standards and specifications described in the *Indiana Handbook for Erosion Control in Developing Areas* (IDNR, no date) and EPA's *Stormwater Management for Construction Activities* (no date).

- Construction will follow Indiana Clean Water Law requirements for construction activities.

- All erosion and sediment control measures will be established prior to construction or as the first step in construction.

- USFWS will be notified of erosion control measures implemented in the MPTR and may inspect these measures if necessary.

- Erosion and sediment control measures will be monitored at least once per week to verify proper use.

- All areas disturbed by construction activities will be seeded and mulched or sodded and fertilized unless the area is to be paved or built upon.

Training and Mission-related Activities

A number of training-related activities that take place on Camp Atterbury have the potential to affect Indiana bats. Examples of these activities include the use of troop labor to clear roadsides, firebreaks, firing points, and fence lines that have become overgrown with woody brush and small trees, and the planned use of M83 smoke grenades and smoke pots and generators containing TPA. The installation must consult on a case-by-case basis each time one of these activities is planned or required. Consultation with USFWS for these activities as a group and considered on a programmatic level as is the objective of this document would largely eliminate the need for consultation on a case-by-case basis.

The USFWS BFO has developed guidance (provided in Appendix D) to aid in determining whether or not a project involving the clearing of small-diameter trees is likely to affect Indiana bats. This guidance should not be used for projects involving the clearing of trees in stream or river corridors, or around other permanent waterbodies. For purposes of this guidance, the following definitions will be used:

- **Linear maintenance projects** involve clearing along a linear feature. Examples include pipeline, roadway, and powerline rights-of-way. Total width of clearing must be less than 75 ft.

- **Small-scale construction projects** require the clearing of less than one acre of land.

- A **wooded landscape** is defined as having greater than 50 percent wooded canopy cover. To determine the percent of wooded canopy cover, center the project in a 2.5-mi radius

circle and determine whether more than 50 percent of the area covered by the circle is wooded. A 2.5-mi radius is the typical maximum foraging range of an Indiana bat maternity colony.

If the clearing of small-diameter trees (under five inches dbh) is anticipated, the following steps should aid in predicting Section 7 consultation requirements:

1. If the project area is considered suitable Indiana bat habitat, proceed to Step 2. If it is not known whether or not the project area is considered suitable Indiana bat habitat, contact the Bloomington Field Office for help in making that determination.

2. For linear maintenance projects or small-scale construction projects that only remove woody vegetation less than three inches dbh and no seasonal tree clearing restrictions are anticipated, take of Indiana bats will be held to the insignificant or discountable level, and formal Section 7 consultation would not be required.

3. In areas within wooded landscapes, it is anticipated that there would be a better supply of current and future roost trees for Indiana bats, compared to areas that do not meet this definition. Therefore, restrictions on the clearing of small-diameter trees are typically less stringent in wooded landscapes. As indicated in Step 2, no restrictions are anticipated for clearing woody vegetation less than three inches dbh. In addition, larger trees (between three and five inches dbh) can also be cleared for linear maintenance projects or small-scale construction projects in wooded landscapes. However, these larger trees can be cleared only if there is wooded habitat contiguous to the clearing that is at least as large (in area) as the clearing. The purpose of this criterion is to protect isolated blocks of wooded habitat, particularly those that may be important as travel corridors for bats. For example, if a wooded fenceline bisects a nonwooded area, that fenceline may be particularly important to bats, even though the total wooded area involved is small.

4. For clearing of trees over five inches dbh, informal Section 7 consultation will likely require procedures to avoid take of Indiana bats. In many cases, seasonal tree clearing restrictions (no tree clearing from 15 April through 15 September) will be sufficient to avoid take of bats. However, measures that will be needed to avoid take will vary among projects and will be determined through

informal consultation with the USFWS. If take cannot be avoided, formal Section 7 consultation will be required.

These are general guidelines and site-specific conditions, cumulative impacts, or indirect effects may dictate deviation from these guidelines. Additionally, knowledge of the Indiana bat population on a particular site must be considered. As previously noted, even if a land manager is certain that a project meets the definition of a linear maintenance project or a small-scale construction project as defined in this guidance, informal consultation with the USFWS BFO is still required (see Appendix D).

Construction and Demolition Activities

Construction and demolition activities at Camp Atterbury, excluding any demolition activities that may occur on the ranges, will be conducted in accordance with necessary ESA Section 7 consultation with the USFWS BFO as described in the guidelines above. Major construction and demolition activities are those activities that may have a negative impact on forested areas at Camp Atterbury that are suitable for maternity roosting sites. Camp Atterbury's natural resources manager will be responsible for determining the need for ESA Section 7 consultation, which would not be required for those activities that would occur in nonforested areas, or that would be in compliance with the forestry management measures outlined previously. A separate BA would be prepared for major construction and demolition activities that are likely to either jeopardize the continued existence of the Indiana bat at Camp Atterbury or result in destruction or adverse modification of bat habitat.

Annual Report to the U.S. Fish and Wildlife Service

In accordance with the Biological Opinion issued by the USFWS BFO for the MPTR (1998), Camp Atterbury will provide an annual report to the USFWS BFO by 30 November of each year. The required elements of the annual report include the following:

- An evaluation of habitat quality in the IBMZs (to be done every three years) and details regarding the management activities that have been implemented in the IBMZs.

- An update on the status of erosion monitoring and control programs.

- Details on the annual use of M18 colored smoke grenades.

- Camp Atterbury will use results of biomonitoring conducted at Fort Leonard Wood, Missouri to evaluate potential toxicological effects of TPA smoke grenades to Indiana bats. During January through March 1999-2003, Camp Atterbury will review results presented in annual reports prepared by Fort Leonard Wood and submitted to the Service as required by the Terms and Conditions in the Biological Opinion/Take Statement for Base Realignment and Closure activities at Fort Leonard Wood. Chemical analyses of surrogate bat tissue (whole body analyses), gross anatomical and histopathological tissue analyses of surrogate bat lung tissue, chemical analyses of guano, and chemical analyses of fish and sediment shall be reviewed. If detectable amounts of TPA or lung damage are noted in samples collected at Fort Leonard Wood, but not in samples collected at reference sites, Camp Atterbury shall initiate an investigation to assess the potential for M18 colored smoke grenades to cause injury to Indiana bats at Camp Atterbury. A draft study plan for investigating effects of M18 colored smoke grenades shall be submitted to and approved by the Service at least 60 days prior to initiation of the proposed study.

- A characterization of pesticide applications.

- An assessment of Camp Atterbury's efforts to incorporate materials related to Indiana bats into the Environmental Awareness training program.

The FY 1999, 2000, and 2001 annual reports submitted by Camp Atterbury to the USFWS BFO are provided in Appendix C.

4.2.2.2 Monitoring

In addition to the above guidelines, the INRMP and ESMP recommended that an Indiana bat monitoring program be established to document the presence of Indiana bats and the utilization of roost trees on the installation. The monitoring program will include annual emergence counts at known roost trees, as well as mist netting and radiotelemetry tracking every three years.

At a minimum, the following information for each bat captured will be consistently recorded:

- Capture location
- Time of capture
- Species
- Sex
- Age class
- Reproductive condition (lactating or pregnant)
- Weight
- Location of maternity roost site (if known)

Long-term monitoring information will be used to evaluate the effectiveness of the ESMP in meeting Indiana bat recovery goals. Although compliance with the ESMP will contribute to the success of the specific Indiana bat population at Camp Atterbury, as well as the overall recovery of the species, it is important to consider that certain negative impacts may occur that are beyond the control of the installation. For example, harm to the population may be caused at the hibernacula, during spring or fall migration, or at the installation by activities on surrounding properties.

Current and future bat survey results will be mapped and maintained on a GIS database of bat colony sites. When identified, these sites will be avoided, or enhanced, to encourage roosting of maternity colonies. The results of all monitoring activities will be reported to the USFWS.

Mist netting will be conducted during the late spring and summer months. Guidelines for netting Indiana bats have been developed by the USFWS Indiana Bat Recovery Team to standardize the procedure and maximize the potential for capture of bats at a minimum effort level. The guidelines are listed below.

- *Netting season*. The period from 15 May through 15 August defines the acceptable limits for documenting the presence of summer populations of Indiana bats. Netting efforts outside these dates rely far more heavily upon positive results (captures) than negative results (a failure to capture bats). If Indiana bats are not caught, it cannot necessarily be concluded that the bats do not use the area during the summer. Even when bats are caught, capture should be carefully interpreted. If only a single bat is captured, it may be a transient or migratory individual. Several captures, including adult females and young of the year, indicate that a summer nursery colony is most likely active in the area. At the very least, it indicates that the site is an important habitat for transient bats.

- *Mist nests*. For mist nets, the finest, lowest-visibility mesh that is commercially available should be used. Currently, the finest mesh on the market is a 2 ply, 50 denier nylon (denoted 50/2). The mesh should be approximately 1 ½ inches.

- *Hardware*. No specific hardware is required. There are many suitable systems of ropes and/or poles to hold the nets. The system of Gardner, Garner, and Hofmann (1989) has been reported to be effective.

- *Net placement*. Potential travel corridors, such as streams and logging trails, typically are the most effective places to net. Place the nets perpendicular to the corridor. Nets should fill the corridor, side to side, and from stream (or ground) level up to the canopy. A typical set is 23 ft high (three nets stacked on top of one another) and up to 66 ft long.

  Occasionally it may be desirable to net where there is no good corridor. Take care to get the nets up into the canopy. The typical equipment described above may be inadequate for these situations.

- *Minimum level of effort*. For stream corridors, use one net site per kilometer of stream; for non-corridor land tracts, use two net sites per square kilometer of habitat. Netting at each site should consist of four net nights (unless bats are caught sooner), a minimum of two net locations at each site (preferably no closer than 100 ft), a minimum of two nights of netting,

a sample period beginning at sunset and lasting a minimum of five hours, net checks every 20 minutes, and no disturbance near the nets other than to check them and to remove bats.

- *Weather conditions*. Severe weather adversely affects bat capture. If Indiana bats are caught during weather extremes, it is probably because they are at the site and active despite the inclement weather. In contrast, if bats are not caught, it may be that there are no bats at the site or that they are there but inactive to avoid the weather. Negative results combined with any of the following weather conditions throughout all or most of a sampling period are likely to require additional netting: precipitation, temperatures below 10° C, or strong winds (nets flailing in the wind are more likely to be detected by the bats).

- *Moonlight*. There is some evidence that small myotine bats avoid brightly lit areas, perhaps in an effort to avoid predators. It is typically best to set nets under the canopy where they are out of the moonlight, particularly when the moon is at least half-full.

4.2.2.3 Environmental Awareness

The Environmental Awareness component of Camp Atterbury's Integrated Training Area Management (ITAM) Program has developed educational materials and conducted training for the military trainers. These training sessions focus on improving awareness of the Indiana bat and its habitat, overall protection of Camp Atterbury's natural resources, and environmental compliance, particularly with respect to the ESA. Topics covered include no tree cutting, ensuring tracked vehicles remain on trails, and the proper use of smoke grenades. As specified in the MPTR BA (Montgomery Watson and 3D/I, 1998), a training manual or brochure will be developed that contains information on Indiana bats, and signs will be posted on the boundaries of Indiana Bat Management Zones. A contract has been put in place to produce a poster series and pamphlets that will be distributed to all units throughout the state to raise awareness for the Indiana bat. Training programs include providing a Unit Environmental Compliance Officer (UECO) course for all units training at Camp Atterbury, and an advanced Non-Commissioned Officer (NCO) course to address Environmental Awareness. These awareness issues are discussed in further detail in the Camp Atterbury annual reports submitted to the USFWS BFO, which are provided in Appendix C.

4.3 SCOPE OF ANALYSIS

This BA addresses ongoing and future anticipated military activities that may affect the Indiana bat during the summer maternity season. The analysis focuses on three aspects of the proposed action with reasonable potential to affect Indiana bats: (1) effect of current and anticipated future military activities on suitable summer habitat; (2) effect of exposure to sound; and (3) effect of exposure to chemicals in training materials. Because no Indiana bat hibernacula are located on Camp Atterbury, and Indiana bat spring staging and fall swarming do not occur there, analyses herein focus on Indiana bats that roost and forage on the installation during the summer season (15 April to 15 September).

4.3.1 Effect of Military Activities on Indiana Bat Habitat

The proposed action is the implementation of current and future anticipated military activities at Camp Atterbury. Factors that must be taken into consideration in evaluating the impacts of training activities on endangered species habitat such as that of the Indiana bat include (1) minimum population size and habitat area, (2) management of the population of a single species, and (3) integration of endangered species management with the military mission (Tazik et al., 1992). These factors and activities that may have direct potential impacts on the Indiana bat are addressed here.

An assessment of Indiana bat habitat suitability on Camp Atterbury was also investigated. Habitat suitability was based primarily on the presence of potential roost trees as listed in Table 4-1 and shown in Figure 4-5. Potential Indiana bat roost habitat was defined for the purposes of this report as a forest stand containing at least 16 live potential bat roost trees per acre, as stated in the USFWS BFO Indiana Bat Management Guidelines (Appendix D).

4.3.2 Effect of Sound

Previous reports addressing the auditory sensitivity of Indiana bats were researched to determine whether Indiana bats are affected by sound generated by military activities at Camp Atterbury and other military installations conducting similar training exercises. Existing data on the auditory capabilities of Indiana bats and similar species were used to evaluate impacts of sound generated by military activities. Sound generated by training in the human audible range (20 hertz (Hz) to 20 kilohertz (kHz)) was investigated. Ultrasound

was not investigated because it dissipates rapidly and is not likely to reach Indiana bats at high intensities that could damage auditory systems. Ultrasound that reaches Indiana bats is not likely to interfere with echolocation because bats are highly resistant to interference of their own calls. Most bats aptly discriminate echoes and filter interference (Griffin and Grinnell, 1958; Schmidt and Joermann, 1986; 3D/I, 1996; Montgomery Watson and 3D/I, 1998).

4.3.3 Toxicological Effects of Exposure to Chemicals in Training Materials

Indiana bats on Camp Atterbury may be exposed to training substances when they roost in trees or forage during the summer maternity season. Previous reports addressing the toxicological effects to Indiana bats from exposure to smoke obscurants containing TPA were researched to determine whether Indiana bats would be affected by military training activities at Camp Atterbury and other military installations conducting similar training exercises. The potential for toxicological effects from exposure to proposed training materials containing TPA, specifically M83 smoke grenades and smoke pots and generators, to be used at Camp Atterbury is assessed here.

4.4 EFFECTS ANALYSIS AREA

A mist net survey conducted in 1997 indicated that Indiana bats are distributed throughout the installation. This BA assesses the effects of the proposed action on summering Indiana bats within the boundaries of Camp Atterbury.

4.5 AFFECTED HABITAT DESCRIPTION

A detailed description of the physical environment of Camp Atterbury, including topography, climate, geology, soils, air quality, water resources, wildlife, vegetation, and land use, is contained in Section 3 of the Camp Atterbury INRMP (Tetra Tech, 2001). The description of these resources is incorporated by reference.

4.6 STUDY METHODS

The methods used to analyze the effects of military activities on the Indiana bat are discussed here. The results of the analysis are provided in the next section.

4.6.1 Effect of Military Activities on Indiana Bat Habitat

In a bat survey by Montgomery Watson at Camp Atterbury in the summer of 1998, 23 of the 196 total captures on the installation were Indiana bats. Three primary roost trees and 17 alternate roost trees were discovered on Camp Atterbury by radiotracking adult Indiana bats (Montgomery Watson, 1999). While population size cannot be estimated by capture rates, the high capture rate and wide distribution of the bats across more than 27,000 acres of Camp Atterbury training areas suggest that the installation contains a large contiguous tract of suitable summer habitat for Indiana bats (Montgomery Watson and 3D/I, 1998).

Studies have indicated that Indiana bats require a relatively large area to meet its roosting requirements, and typical young, highly fragmented forests in the midwestern United States do not meet these requirements (Kurta et. al, 1996). However, Camp Atterbury contains relatively large blocks of forested habitat available to Indiana bats (USFWS, 1998). Potential Indiana bat habitat suitability was assessed by calculating the total acreage of potential Indiana bat habitat, defined for the purposes of this report as a stand containing at least 16 potential Indiana bat roost trees per acre. In their draft guidelines for forest management (see Appendix D), the USFWS recommended that at the minimum, 16 live potential Indiana bat roost trees per acre should be maintained in a stand during timber management activities, as these trees are a valuable component of Indiana bat habitat. Information on tree diameters for each tree type within each stand was not available. Commercial timber stand data collected in 1995 and provided by Camp Atterbury were entered into a GIS. The location and amount of suitable Indiana bat roost habitat affected by the proposed action (ongoing military activities) were determined for each training area.

Other topics addressing the effects of military training on the Indiana bat have been researched here, including live fire training (and the effects of illumination), bivouac usage, and concurrently managing endangered species with military mission objectives. Two types of live fire training will be analyzed: 1) direct fire, or live fire to fixed or moving targets visible along a line-of-sight on ground level from firing points (usually less than 100 m away), and 2) indirect fire, or live fire from fixed firing points to remote targets in the impact area using mortars and artillery. An analysis to determine the proximity of Indiana bat habitat and roosts to firing points will also be performed.

4.6.2 Effect of Sound

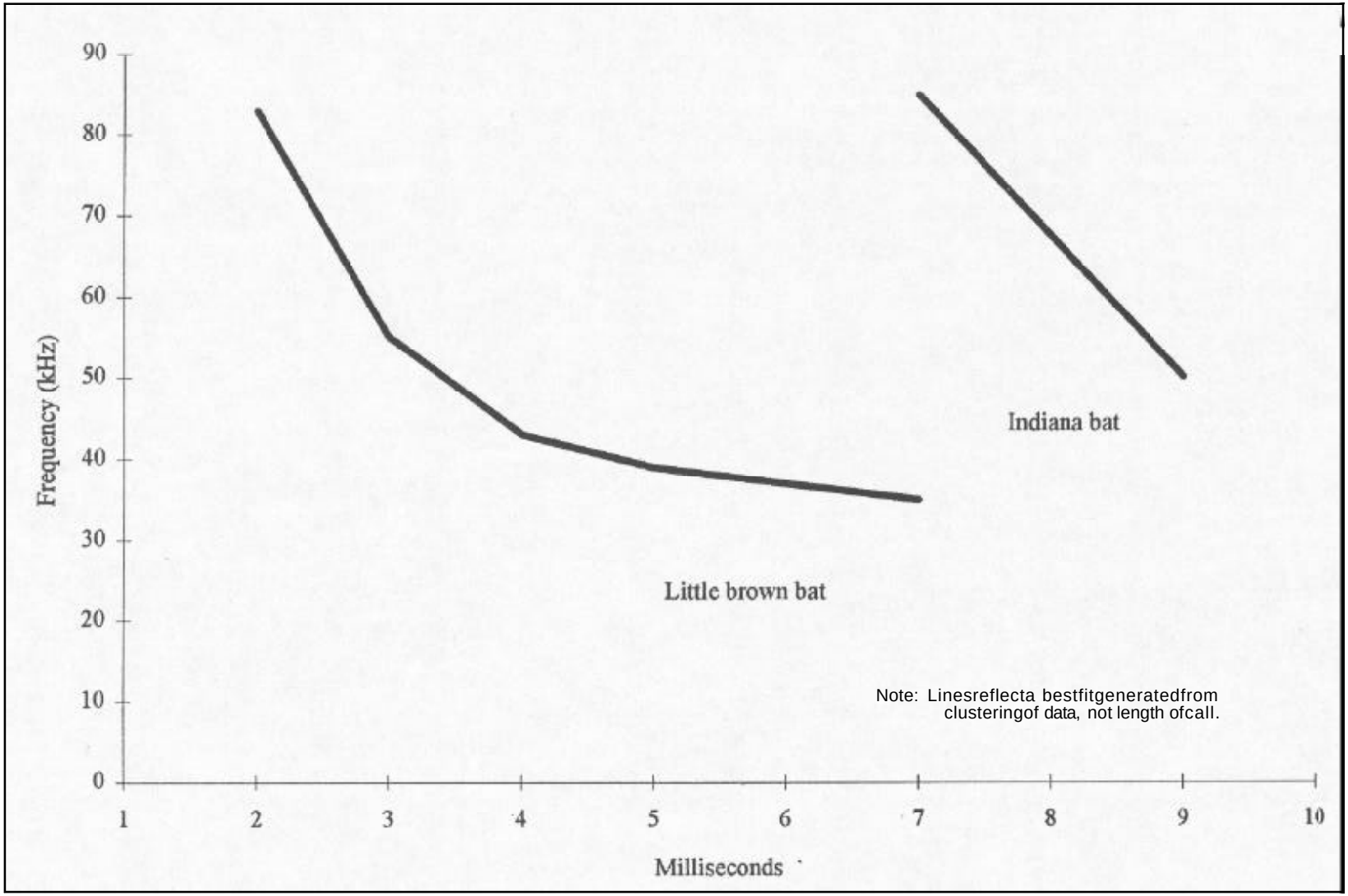
Adverse effects of exposure to sound are related to frequency, intensity, and duration. Frequency is the amplitude of sound waves measured in kHz; intensity is the loudness of sound measured in decibels (dB); and duration is the time length of exposure to the sound event. Sound generated by training activities is generally impulse noise having peak energy at low frequency (< 1 kHz) and high intensity (> 100 dB), and often consists of a series of very short (milliseconds) individual impulses.

Echolocation calls of the Indiana bat use a peak frequency (frequency with the greatest intensity) of 50 kHz, with a range of 41 to 75 kHz (Fenton and Bell, 1981). A related bat species, the little brown bat (*Myotis lucifugus*), has a similar frequency range of echolocation calls (38 to 78 kHz). Figure 4-6 demonstrates the similarity in frequency of the calls of the little brown bat and the Indiana bat; the duration of the Indiana bat call is several milliseconds longer. Suthers (1970) indicates that peak auditory sensitivity of the bat auditory system is similar to peak frequencies of echolocation calls. Audiograms indicate that the little brown bat is sensitive to sound between 10 and 130 kHz, with greatest hearing sensitivity between 35 and 40 kHz (Grinnell, 1963; Dalland, 1965). Because little literature exists on the auditory capabilities of the Indiana bat, it is assumed the auditory sensitivity of the Indiana bat is similar to readily available data of the little brown bat, and sounds likely to harm little brown bats may also harm Indiana bats (Montgomery Watson and 3D/I, 1998).

In the BA documenting the potential impacts of construction and operation of the MPTR on the Indiana bat (Montgomery Watson and 3D/I, 1998) for Camp Atterbury, the sound generated by training materials was investigated to determine whether frequencies generated by training materials are within the auditory sensitivity of the species. Two approaches were used to analyze the effects of sound: (1) evaluate the effects of sound generated by proposed training using existing data on the auditory capabilities of Indiana bats and similar species and (2) compare characteristics of sound generated during past and proposed training events using existing data. Weapons, equipment, vehicles, and materials tested included machine guns, artillery flash simulators, earthmoving equipment, and smoke grenades (Montgomery Watson and 3D/I, 1998; USFWS, 1999).

4.6.3 Toxicological Effects of Exposure to Chemicals in Training Materials

Smoke grenades are used as part of regular training exercises on Camp Atterbury to simulate realistic



Comparison of Call Sonograms

Camp Atterbury
Edinburgh, Indiana
Figure 4-6

Source: F enton and Bell,1981.

battlefield conditions. The use of M18 smoke grenades containing terephthalic acid (TPA) is restricted in that they should be used at least 36 m away from trees to the maximum extent practicable between 15 April and 15 September (Montgomery Watson and 3D/I, 1998). M83 smoke grenades and smoke pots and generators containing terephthalic acid (TPA) are proposed to be introduced into training activities at Camp Atterbury. Camp Atterbury plans on using 500 M83 grenades a year (primarily between May and September); these grenades will be used at most ranges throughout the installation. The quantity of and locations for proposed use of smoke pots and generators are currently not available, but is expected to be less than the number of proposed grenades.

The primary combustion products of TPA are carbon monoxide, carbon dioxide, sulfur dioxide, benzene, toluene, and formaldehyde, all of which are released in a gaseous state. It is highly unlikely these compounds will accumulate in soil or water because they volatize and are transformed by photochemical reactions and biodegradation. The particulate matter of TPA may be removed from the atmosphere by dry or wet deposition (Harland Bartholomew and Assoc., 1997).

Indiana bats may be exposed to training materials during the summer maternity season while roosting or foraging. The MPTR BA included an Ecological Risk Assessment (ERA) which assessed the effects of exposure from training materials used on Camp Atterbury, and another ERA was performed to assess the impacts of M83 grenades on Indiana bats at Fort Leonard Wood, Missouri. The toxicity of potential stressors and other results of the ERAs will be discussed in Section 4.7.3.

4.7 RESULTS

4.7.1 Effect of Military Activities on Indiana Bat Habitat

An analysis was performed to determine the amount of suitable Indiana bat habitat on Camp Atterbury. Potential Indiana bat habitat suitability was assessed by calculating the acreage of potential Indiana bat habitat (defined as a stand containing at least 16 potential bat roost trees per acre) for each training area using commercial timber stand data provided by Camp Atterbury. The amounts and locations of suitable habitat affected by the proposed action (ongoing military activities) for each training area are listed in Table 4-3 and shown in Figure 4-5. Camp Atterbury contains 10,500 acres of potentially suitable Indiana bat roost habitat in its training areas, which make up 39 percent of the total maneuver area acreage. Four training areas (4AN, 4AS, 5CE, and 5CW) had potential Indiana bat habitat in more than 68 percent of the training area.

Table 4-3

Acreage of Suitable Indiana Bat Roost Habitat by Training Area

Training Area	Acres of Suitable Habitat	Percentage of Training Area
1AE	125.6	17.8%
1AW	321.2	46.8%
1B	13.4	5.2%
1C	133.8	20.3%
1D	80.3	15.9%
1E	49.7	28.3%
1F	0.8	0.2%
2A	102.7	20.6%
2AE	161.9	26.7%
2AW	0.0	0.0%
2B	48.3	7.9%
2C	40.6	9.0%
3AN	321.7	43.3%
3AS	182.8	23.9%
3B	329.4	35.1%
3C	296.4	28.3%
4AN	511.4	93.3%
4AS	698.0	68.6%
4BN	290.9	42.7%
4BS	436.4	54.5%
4CE	325.5	39.9%
4CW	495.6	48.0%
5AE	240.6	36.1%
5AW	361.7	56.3%
5B	477.4	56.4%

Table 4-3

Acreage of Suitable Indiana Bat Roost Habitat by Training Area (continued)

Training Area	Acres of Suitable Habitat	Percentage of Training Area
5CE	971.1	91.2%
5CW	664.9	70.8%
6AE	376.3	32.3%
6AW	537.0	31.3%
6BE	243.1	26.9%
6BW	200.1	18.7%
7A	707.8	42.2%
7B	737.7	49.7%
AFS	2.5	2.4%
Airfield	6.1	3.6%
SEW	49.8	28.3%
Z	4.5	7.0%
TOTAL	10,547.0	39.3%

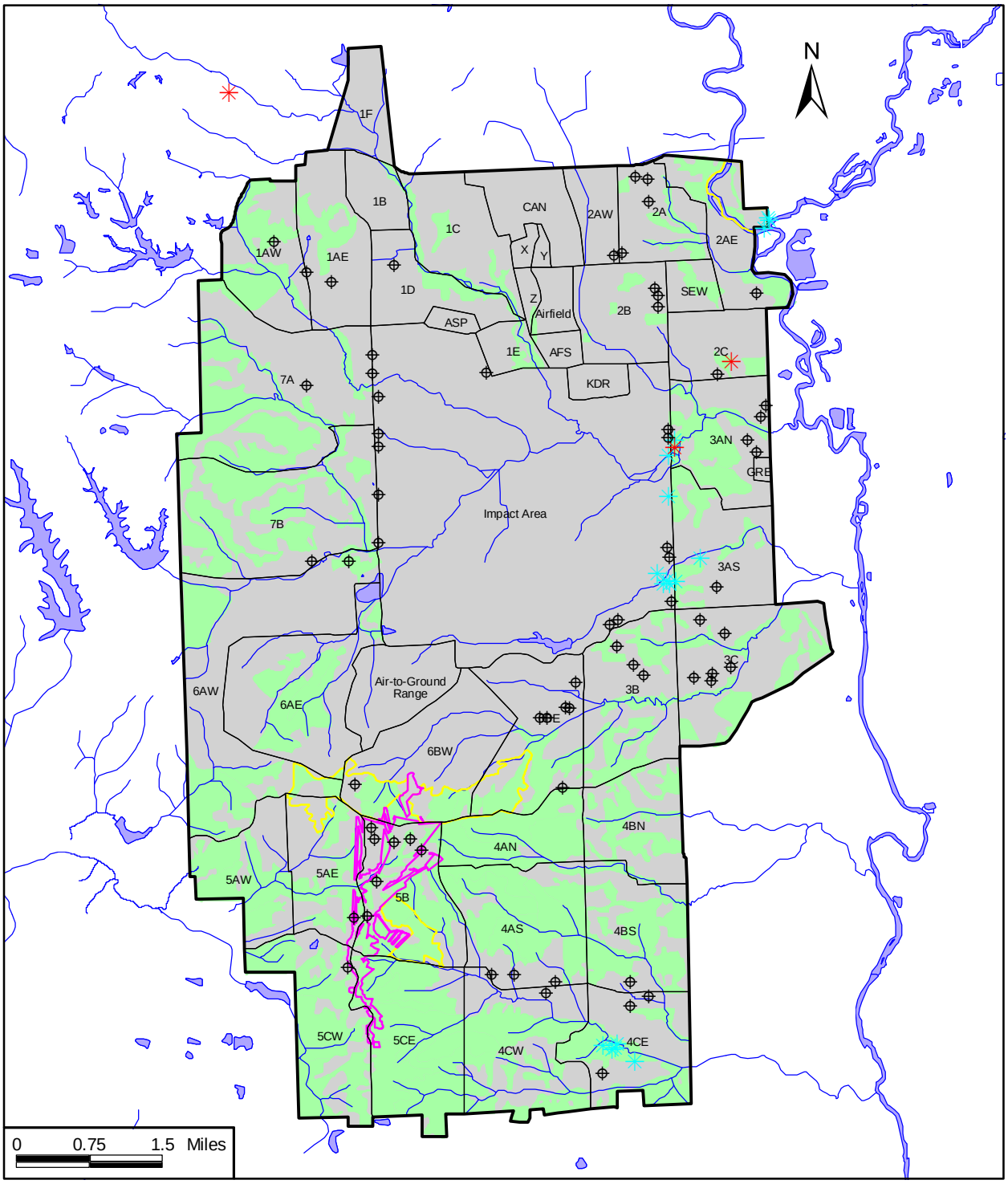
Several activities associated with military training may have a direct or an indirect impact on the Indiana bat and its habitat. These include bivouac sites, off-road vehicle maneuver training, live fire illumination and training, and aviation training. Use of bivouac sites in the vicinity of Indiana bat roosts could result in direct effects on nests and foraging activity and indirect effects through habitat damage. Additional disturbances may be caused by digging activity, brush and trail clearing, cutting an Indiana bat roost tree with bats in it, or direct encounters between personnel and bat. However, these are likely to be rare occurrences and the chance of overall incidental take is likely to be small.

Live fire training poses a threat to Indiana bats as the loss of or damage to trees identified as having high value as potential Indiana bat roost trees listed in Table 4-1 from ammunition crossfire will reduce habitat quality. For direct fire training, however, trees more than 100 m away from targets may be only infrequently struck by ammunition fire. In this case, occasional ammunition strikes will most likely cause minimal

damage to the tree (Montgomery Watson and 3D/I, 1998). Significant damage could occur within 100 m of targets, but generally the land around firing points is cleared of trees. In addition, the same firing points are used repeatedly, and no new firing points have been created recently outside of the new MPTR. Indirect fire from fixed firing points to remote targets in the impact area using mortars and artillery has the potential to affect Indiana bats in that errant artillery may significantly damage habitat, but these occurrences are likely to be rare. Areas within the impact area are not considered suitable habitat for Indiana bats. The potential also exists for Indiana bats to be struck down by ammunition crossfire, although the likelihood of such an occurrence is extremely rare and thus the chance of incidental take would be very small. Figure 4-7 shows an overlay of military activities on potential Indiana bat habitat. Eighteen of the 70 permanent firing points (26 percent) on Camp Atterbury are within 100 m of potential Indiana bat habitat. One firing point is within 100 m of a known alternate Indiana bat roost, though it is likely there are other unrecorded roosts on the installation.

Weapons and artillery flash simulators produce an instantaneous flash particularly noticeable during nighttime training, but they typically do not generate a constant illumination. Colored signal flares generally produce the brightest and longest-lasting illumination of most training materials commonly used at Camp Atterbury. These signal flares are launched to approximately 200 m above the ground surface and generate 8,000 to 90,000 lumens for 7 to 40 seconds. No data are available to assess the impacts of illumination on Indiana bats; however, several bat species have been observed foraging near street lamps (Geggie and Fenton, 1984; Pennington, 1992), possibly due to the large number of insects that hover near street lights. This may indicate that Indiana bats are not likely negatively affected by light sources at night. Therefore, signal flares and artillery flash simulators that produce less light for much shorter durations are not likely to adversely affect foraging Indiana bats (Montgomery Watson and 3D/I, 1998).

Controlled burning on Camp Atterbury is not considered to have a negative effect on the Indiana bat habitat as only open fields are burned, and burns are normally conducted outside the Indiana bat maternity roost season. Wildfires could be ignited from lightning strikes, ammunition fire, or other causes. Although the effects of wildfire are difficult to predict, they may be beneficial to Indiana bats in that snags are created and underbrush is cleared out, although incidental loss of individual bats may occur.



LEGEND

- r Primary Indiana Bat Roost Site
- r Alternate Indiana Bat Roost Site
- Potential Indiana Bat Habitat
- Stream
- Firing Point
- Installation Boundary
- Training Area Boundary
- MPTR Boundary
- IBMZ Boundary

Source: Camp Atterbury, 1999.

Military Activities and Indiana Bat Habitat

Camp Atterbury
Edinburgh, Indiana

Figure 4-7

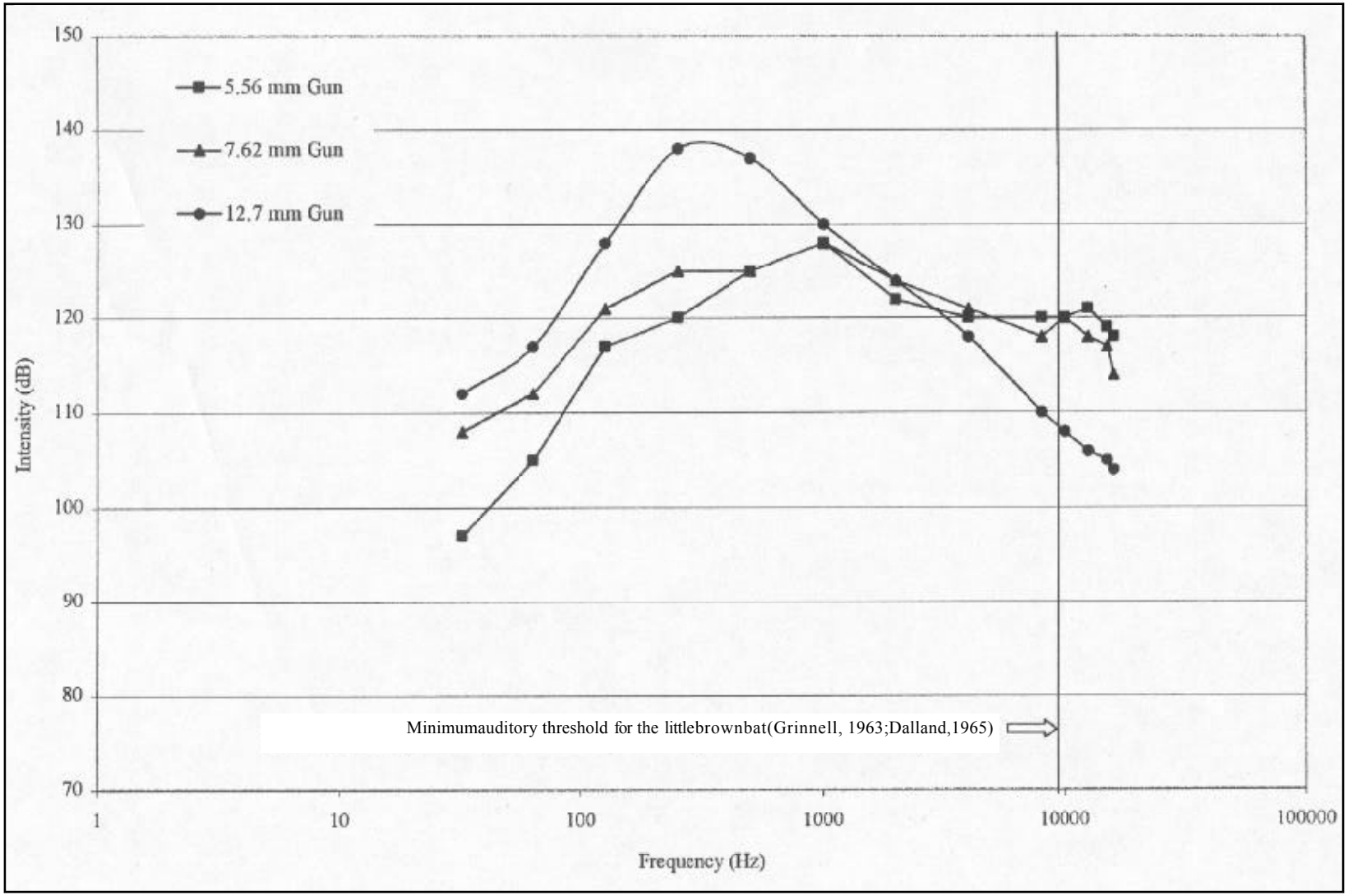
4.7.2 Effect of Sound

The MPTR BA provided results of tests to determine whether the sounds generated by training materials and equipment are within the auditory sensitivity of the species. The BA indicated that proposed training in the MPTR will not expose Indiana bats to greater intensity or duration of sound than that of past training events, with the assumption that sound intensity and duration did not adversely affect bats on Camp Atterbury. While this assumption has not been tested, it is reasonable given the wide distribution of bats captured on the base (USFWS, 1998). A similar BA was conducted to assess the effects of training on Indiana and gray bats at Fort Leonard Wood, Missouri, and one of its conclusions was sounds generated by training events (simulated artillery and small-arms fire) do not startle, frighten, or cause bats to flee the area (Harland Bartholomew and Assoc., 1997; USFWS, 1998). Another BA for Fort Leonard Wood which assessed the effects of its master plan on endangered species indicated that bats do not avoid active ranges or alter foraging behavior during nighttime training maneuvers (3D/I, 1996).

The MPTR BA produced spectral energy diagrams for machine guns commonly used on Camp Atterbury. Figure 4-8 indicates that these guns generate sound partially within the range of auditory sensitivity in the little brown bat; therefore, it is likely it is in the auditory range of the Indiana bat as well. Above 10 kHz, the minimum auditory threshold for the little brown bat, 5.56-mm and 7.62-mm guns generate sound intensities as high as 120 dB (Montgomery Watson and 3D/I, 1998). However, the peak sound energy produced by the guns is 130 to 140 dB and occurs around 0.1 kHz, well below frequencies audible to bats.

Sound data were not available for military vehicles used for training at Camp Atterbury, such as the Abrams M1 tank, Bradley fighting vehicle, attack helicopter, or TOW launch vehicle. Testing of sounds for the Fort Leonard Wood training BA determined that sounds from operation of heavy equipment (bulldozers and earth movers) generated frequencies up to 20 kHz, with peak frequencies less than 0.125 kHz (3D/I, 1996). Although bats may hear sounds generated from military equipment and vehicles, peak sound energy is likely to be well below frequencies audible to bats (Montgomery Watson and 3D/I, 1998).

The M83 smoke grenade currently used on Camp Atterbury was not included in peak sound intensity level testing, but three other smoke grenades (M18 colored smoke grenade, LA81 smoke grenade, and AN-M8 hand smoke grenade) were tested. Since little information exists on the effects of M83 grenade sounds on



Spectral Energy Diagrams for Selected Machine Guns

Camp Atterbury
Edinburgh, Indiana
Figure 4-8

Source: Montgomery Watson and 3D/I, 1998.

the Indiana bat and the M83, M18, LA81, and AN-M8 grenades produce similar sounds, it is assumed the effect of M83 grenade sounds on the Indiana bat are similar to the effects of the other grenades. The M18, LA81, and AN-M8 grenades produce peak sound intensities of 148.3 dB (Montgomery Watson and 3D/I, 1998), similar to peak intensities generated by machine gun fire as discussed earlier in this section. Sound range levels in kHz for the grenades were not determined, but given that peak sound intensities of the grenades are similar to the peak intensities generated by machine gun fire, it is likely that sound range levels generated by smoke grenades are also similar to or less than sounds range levels generated by machine guns, which are well below frequencies audible to bats. Although it is likely that bats can hear some of the grenade sounds, it is not likely that the sounds will startle or frighten them (USFWS, 1998).

4.7.3 Toxicological Effects of Exposure to Chemicals in Training Materials

M83 smoke grenades contain terephthalic acid (TPA), the effects of which have been tested in laboratories on rats and rabbits. Oral ingestion of a 5 percent TPA diet by rats over two years resulted in bladder calculi, leading to nephropathy (an abnormal state of the kidney, especially one associated with or secondary to some other pathological process) and eventually death (Woodward, 1986). There were no adverse effects observed in rats after inhalation of pyrotechnically disseminated TPA or dermal absorption of 80 mg TPA (Muse et al., 1995; Thomson et al., 1988). However, the results of tests on rats and rabbits can differ from the effects exhibited in bats that are exposed to similar conditions. Nonetheless, Indiana bats have the potential to inhale unsafe concentrations of TPA from grenades, given certain worst-case situations (Harland Bartholomew and Assoc., 1997).

In the 1997 ERA for Fort Leonard Wood, the effects of exposure of M83 grenades and smoke pots containing TPA on Indiana bats were assessed for those bats foraging and roosting (installation-wide) and hibernating (in hibernacula). Exposures were expected to last approximately three minutes, the approximate burn time for the grenade. Comparison of the daily chronic intake value generated from the dispersion models for the grenades and the smoke pots indicate the smoke pots have similar or lower intake values than grenades. Burn times for the two obscurant devices are similar. It was concluded that Indiana bats repeatedly foraging or roosting within 90 m of a training location where a TPA obscurant would be used would inhale unsafe concentrations of TPA smoke and exhibit acute toxicological effects. However, these assumptions were based on worst-case atmospheric and exposure situations that did not take into account

wind direction, and under these worst-case scenarios fewer than 100 individual bats during the maternity season would suffer acute inhalation effects. The BA also stated that if a single bat is limited to actual exposures from 105 or fewer grenades or 107 or fewer smoke pots, there will be no chronic effects (Harland Bartholomew and Assoc., 1997).

The M83 smoke grenade was not included in risk assessments for the 1998 MPTR BA, but the risks of exposure to two other smoke grenades, the AN-M8 hand smoke grenade and the M18 colored smoke grenade, were predicted for Indiana bats. AN-M8 grenades contain hexachloroethane (HC), which was determined to be too toxic for Indiana bats, and the grenades are no longer used at Camp Atterbury. The BA found that acute effects suffered from inhalation of M18 grenade smoke containing TPA are a minor inflammation of the respiratory tract and minute changes in lung cells and the nasal cavity, but the tissue changes are minor and the bats should recover to their normal condition within seven days following exposure. Unsafe concentrations of the grenade smoke travel only short distances (less than 30 m), and the burn time of the smoke is less than one minute. The BA estimated that if the grenades were used within 36 m of trees, approximately 1,000 Indiana bats could experience acute effects. Because Camp Atterbury has required that M18 grenades be deployed at least 36 m away from trees to the maximum extent practicable between 15 April and 15 September, the BA concluded that Indiana bats will not suffer chronic effects from the use of M18 grenades (Montgomery Watson and 3D/I, 1998). Camp Atterbury will also review the results of additional analyses conducted at Fort Leonard Wood investigating the effects of TPA on Indiana bats to evaluate the continued use of M18 grenades on the installation.

As described in Section 3.2, comparison of M83 grenade usage at Fort Leonard Wood and Camp Atterbury shows that Fort Leonard Wood uses a maximum of 3,136 M83 grenades at 22 locations during 131 training days annually for an average maximum of 24 grenades per location per day. Camp Atterbury currently uses an average of six M18 grenades per day from April to September, and proposes to use approximately 500 M83 grenades annually during summer training exercises (1 May through 30 September (153 training days)) for an average of three grenades per day throughout the installation. The quantity of and locations for proposed use of smoke pots and generators are currently not available, but is expected to be less than the number of proposed grenades. High capture rates during mist net surveys suggest that the installation contains a large contiguous tract of suitable summer habitat for Indiana bats and the bats are scattered throughout the installation. Therefore the likelihood of Indiana bat roosts in addition to the documented

two primary and 17 alternate roosts exists in other areas of the installation. Given that only 25 percent of firing points are within 100 m of forest stands containing potential Indiana bat habitat and only one alternate roost is within 100 m of a firing point, and that the Fort Leonard Wood BA found that if exposure is limited to less than 105 grenades then there will be no chronic effects, it seems unlikely that the use of nine TPA grenades per day would have significant adverse effects on Indiana bats at Camp Atterbury.

4.8 EFFECTS ANALYSIS AND DISCUSSION

4.8.1 Effect of Military Activities on Indiana Bat Habitat

One of the mitigation measures in the MPTR BA was for Camp Atterbury to establish four Indiana Bat Management Zones (IBMZs) totaling 777 acres (Figure 4-4) to further enhance the protection of Indiana bat habitat. These zones consist primarily of mature and early successional forest and some open areas vegetated with shrubs and grasses. The zones meet suitable Indiana bat summering habitat requirements, and management measures for the stands are designed to promote growth of a mature forest with an open understory. Military activities within the IBMZs are permitted, with the exception that tracked vehicles are restricted to existing trails and roads. Off-road maneuvers are minimized within the IBMZs.

Approximately 39 percent of the training and maneuver areas at Camp Atterbury contain potentially suitable Indiana bat summertime roosting and foraging habitat, and the habitat is not concentrated in any one particular area of the installation. Potential Indiana bat habitat and therefore Indiana bats are likely to be found scattered throughout Camp Atterbury. Military exercises should not exceed their present level in training areas 4A and 5C located in the extreme southern portion of the installation, as these areas contain greater than 68 percent potential Indiana bat habitat.

Direct effects to Indiana bats from current and proposed military activities at Camp Atterbury are likely to be rare. The areas of greatest risk are live fire targets, off-road vehicle maneuvers, digging activity, and brush and trail clearing. Every prudent measure should be taken to minimize destruction of habitat and incidental take of Indiana bats. Bivouac activities may actually be beneficial to Indiana bats as low understory densities resulting from bivouac use create openings and flyways through the forest (Montgomery Watson, 1999).

Indiana bats on Camp Atterbury have been repeatedly exposed to military activities, as the installation is used intensively for training. It is likely that at least a portion of the active training or impact areas fall within the home ranges of at least one Indiana bat colony. There is no evidence that active ranges have forced Indiana bats to abandon suitable habitat (USFWS, 1998).

4.8.2 Effect of Sound

High-intensity sounds have the potential to damage auditory structures of the Indiana bat ear. Laboratory studies suggest frequent or long-term exposure to sound between 75 and 100 dB may cause minor damage to bat auditory systems (Nielson and Slepecky, 1986; USEPA, 1971). However, the studies did not report the frequency of the damaging sounds, and from this it cannot be concluded that sound generated during training activities will harm Indiana bats (Montgomery Watson and 3D/I, 1998). Previous BAs have reported that although Indiana bats may be capable of hearing sounds generated by training activities, peak sound energy is likely to be well below frequencies audible to bats, and the sounds are not likely to startle or frighten them (Harland Bartholomew and Assoc., 1997; USFWS, 1998). In their Biological Opinion of the MPTR BA, the USFWS concurred with the conclusion that construction and operation of the proposed MPTR is not likely to jeopardize the continued existence of the Indiana bat (USFWS, 1998).

4.8.3 Toxicological Effects of Exposure to Chemicals in Training Materials

Indiana bats have the potential to inhale unsafe concentrations of TPA from repeated exposure to deployment of M18 and M83 smoke grenades and smoke pots and generators during military training activities. However, repeated exposure of individual bats to TPA is unlikely, as M18 grenades are deployed at least 36 m away from trees to the maximum extent practical during the summer maternity roosting season, and Camp Atterbury plans to use an average of just three M83 grenades per day, which will be used at different sites throughout the summer training season. It is recommended that M83 grenades and smoke pots and generators containing TPA also be deployed at least 36 m away from trees to the maximum extent practical during the summer maternity roosting season.

The Fort Leonard Wood BA suggested limiting any release of smoke obscurants containing TPA closer than 120 m to watercourses to between sunrise and sunset, as Indiana bats use stream corridors for flight paths and foraging areas (Harland Bartholomew and Assoc., 1997). In addition, all 20 roost trees, with the exception of one alternate roost tree, found during the bat mist net surveys on Camp Atterbury were located

within 120 m of open water (either stream or pond) (Montgomery Watson, 1999). It is recommended that Camp Atterbury adopt a management measure similar to Fort Leonard Wood and limit TPA smoke obscurant use to at least 120 m away from perennial watercourses during the summer maternity roosting season; if use near such is unavoidable, then it should be limited to daylight hours only. This would affect 8,600 acres, or 32 percent, of the total Camp Atterbury training area acreage (see Figure 4-9 and Table 4-4). The remaining 68 percent of training area lands would permit unrestricted use of smoke obscurants containing TPA.

4.9 STATEMENT OF FINDING

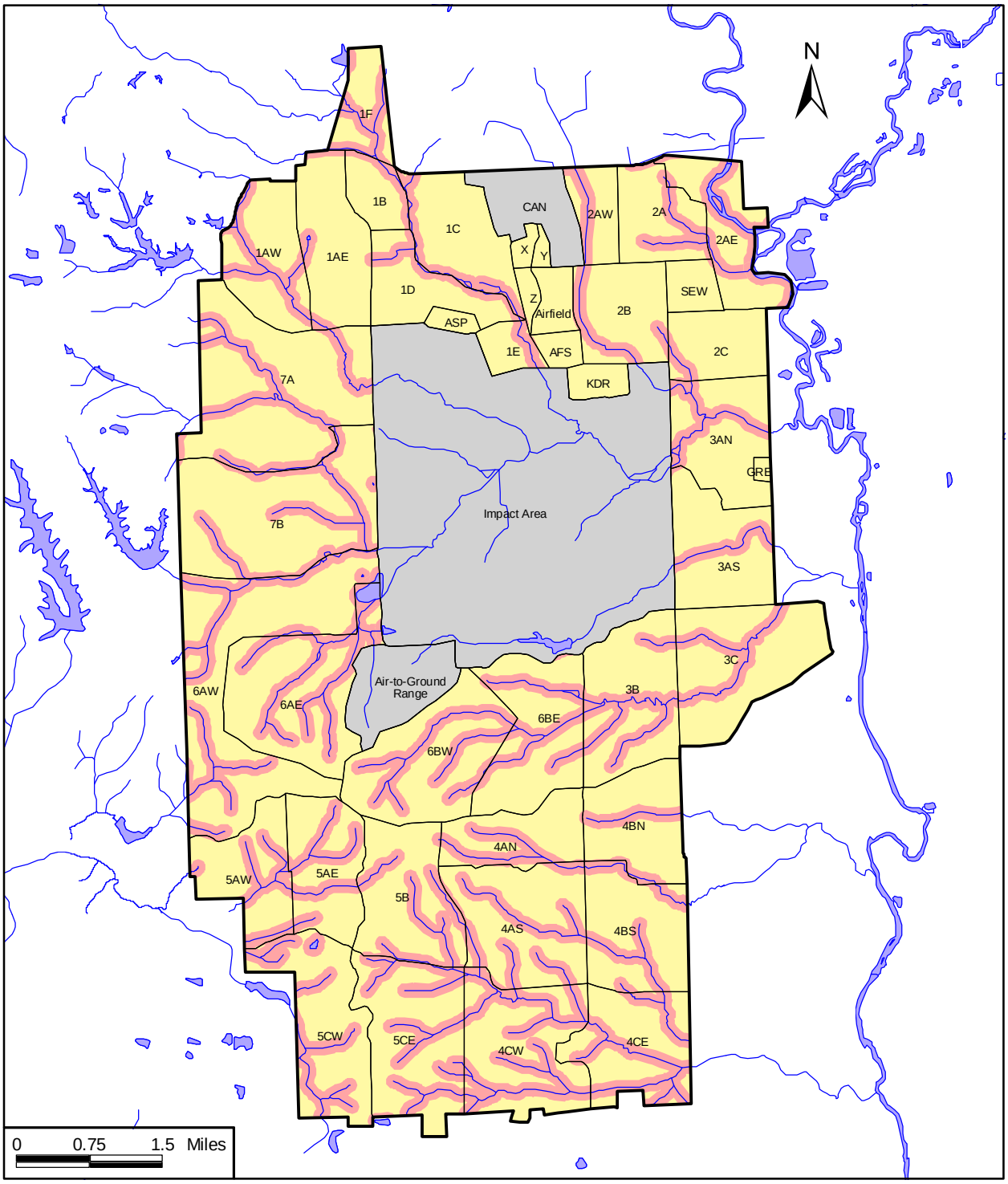
Ongoing and anticipated future military activities at Camp Atterbury may affect but are not likely to adversely affect Indiana bats.

4.9.1 Effect of Military Activities on Indiana Bat Habitat

Direct effects to Indiana bats from military activities are likely to be rare. The areas of greatest risk are live fire targets, off-road vehicle maneuvers, digging activity, and brush and trail clearing. Every prudent measure should be taken to minimize destruction of habitat and incidental take of Indiana bats from military activities. The incorporation of Indiana bat habitat management measures into the forest management section of the Camp Atterbury INRMP and the ESMP (as described in Section 4.2.2) ensures proper protection, management, and enhancement of Indiana bat habitat. Tazik et al., (1992) outlines additional management considerations that must be taken into account when evaluating the impacts of training activities on endangered species. Camp Atterbury would help ensure protection and enhancement of Indiana bat habitat by considering (1) minimum population size and habitat area, (2) multiple-species management in the ecosystem, and (3) integration of endangered species management with the military mission. Each factor is described below.

Minimum Population Size and Habitat Area

The minimum Indiana bat colony size and habitat area necessary to maintain a stable summertime foraging colony are currently unknown because of lack of data (Tetra Tech, 1999). Studies have indicated that the Indiana bat requires a relatively vast area of large mature to overmature hardwood trees to meet its roosting requirements, and Camp Atterbury contains fairly large blocks of available forested habitat (USFWS, 1998).



LEGEND

- Stream
- M83 Grenade Use Limited to Daylight Hours (Within 120 meters of a waterbody)
- M83 Grenade Use Not Restricted due to Potential Presence of Indiana Bats
- M83 Grenades Not Used
- Training Area Boundary

Areas with Restricted M83 Grenade Usage

Camp Atterbury
Edinburgh, Indiana

Source: GIS Calculations.

Figure 4-9

Table 4-4

Restricted M83 Grenade Usage by Training Area

Training Area	Acres of Restricted TPA Usage	Percentage of Training Area
1AE	72.2	10.2%
1AW	224.7	32.7%
1B	59.1	23.0%
1C	148.1	22.4%
1D	115.0	22.8%
1E	52.6	30.0%
1F	165.8	49.3%
2A	156.7	31.5%
2AE	275.7	45.4%
2AW	89.7	31.8%
2B	150.8	24.8%
2C	45.4	10.0%
3AN	191.7	25.8%
3AS	128.0	16.7%
3B	309.5	33.0%
3C	230.1	22.0%
4AN	189.9	34.7%
4AS	388.7	38.2%
4BN	134.7	19.8%
4BS	239.8	30.0%
4CE	371.3	45.5%
4CW	548.7	53.1%
5AE	251.3	37.7%
5AW	224.5	34.9%
5B	307.5	36.4%

Table 4-4

Restricted M83 Grenade Usage by Training Area (continued)

Training Area	Acres of Restricted TPA Usage	Percentage of Training Area
5CE	446.8	42.0%
5CW	366.0	39.0%
6AE	514.2	44.2%
6AW	611.5	35.6%
6BE	298.7	33.0%
6BW	418.1	39.1%
7A	470.7	28.1%
7B	408.9	27.5%
AFS	1.7	1.7%
Airfield	4.6	2.7%
SEW	2.1	1.2%
Z	1.5	2.2%
TOTAL	8,616.3	32.1%

The spatial extent of a colony's regular use area is probably determined by the availability of suitable roost trees. Foraging areas have been reported to range from a linear strip of creek vegetation 0.5 miles in length to a circle around a primary roost tree with a 2.5 mi radius (USFWS, 1999; USFWS, 2000). Canopy closures for prime habitat range from 30 to 100 percent (Gardner et al., 1991b).

Despite the uncertainty of minimum population size and habitat area needed to maintain a healthy population of Indiana bats in an area, achievable goals should be established for the installation and refined as better data are obtained.

Multiple-Species Management in the Regional Ecosystem

In formulating a management plan for an endangered species, it is inappropriate to intensively manage a single species to achieve its carrying capacity while neglecting the needs of other species in the ecosystem.

Management guidelines that permit coexistence of multiple species are necessary. In addition, a single reserve area cannot be depended on to ensure long-term survival. Successful recovery of these species requires cooperation among federal, state, and local management interests to establish a partnership so that species protection and management can be provided at a regional scale.

Integration of Endangered Species Management with the Military Mission

With proper management of and leadership in military training and land management, Camp Atterbury can support the Indiana bat in conjunction with continuing its military mission. Although the possible but unlikely chance for incidental loss remains, a balance can be achieved that provides for protection and recovery of the Indiana bat with minimum impact on the military mission.

4.9.2 Effect of Sound

Although Indiana bats may be capable of hearing sounds generated by training activities, peak sound energy is likely to be well below frequencies audible to bats, and the sounds are not likely to startle or frighten them.

4.9.3 Toxicological Effects of Exposure to Chemicals in Training Materials

Repeated exposure of individual bats to TPA in smoke obscurants used for military training is unlikely. Camp Atterbury plans to use an average of just three M83 grenades per day, and the grenades will be used at different sites throughout the summer training season. To minimize effects, however, it is recommended that Camp Atterbury limit the use of these grenades during the summer maternity roosting season to at least 36 m away from trees and at least 120 m away from perennial watercourses when practical; if grenade use near streams unavoidable, then it should be limited to daylight hours only.

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ACRONYMS AND ABBREVIATIONS

AC	Active Component
ANG	Air National Guard
AR	Army Regulation
ARFTA	Atterbury Reserve Forces Training Area
ARNG	Army National Guard
ARTEP	Army Training Evaluation Program
AS	Army Standard
BA	Biological Assessment
BFO	USFWS Bloomington Field Office
BMP	Best Management Practice
BMZ	Bat Management Zone
°C	degrees Celsius
CA	combat arms
CFR	Code of Federal Regulations
CS	combat support
CSMS	Combined Support Maintenance Shop
CSS	combat service support
dB	decibels
dbh	diameter at breast height
DoD	Department of Defense
DOI	Department of Interior
EA	Environmental Awareness
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
ERA	Ecological Risk Assessment
ESA	Endangered Species Act
ESMP	Endangered Species Management Plan
°F	degrees Fahrenheit
FORSCOM	Army Forces Command
FY	Fiscal Year
GIS	geographic information system
HC	hexochlorethane
HE	high explosive
HSMS	Hazardous Substance Management System
IBMZ	Indiana Bat Management Zone
IDNR	Indiana Department of Natural Resources
INARNG	Indiana Army National Guard
INRMP	Integrated Natural Resources Management Plan
ISM	Installation Support Module
ITAM	Integrated Training Area Management
km	kilometers
LAV	light armored vehicle
M-COFT	Mobile Conduct of Fire Trainer
MACOM	Major Command
MATES	mobilization and training equipment site
MDI	Military Department of Indiana
m	meter
mm	millimeter
MOUT	Military Operating in Urban Terrain
MPTR	Multi-Purpose Training Range

NBC	nuclear, biological, and chemical
NCO	Non-Commissioned Officer
NGB	National Guard Bureau
NMFS	National Marine Fisheries Service
OMS	Operational Maintenance Shop
PDF	Project Design Feature
RFMSS	Range Facility Management Support System
RMZ	Riparian Management Zone
SMA	Special Management Area
OMS	State Operated Mobilization Station
SRTR	Short Range Training Round
T&E	threatened and endangered
TA	Training Area
TOW	Aerial Traced, Wire Guided
TP	training practice
TPA	terephthalic acid
TRADOC	Training and Doctrine Command
TSFO	training set fire observation
TSI	Timber Stand Improvement
UECO	Unit Environmental Compliance Officer
USACE	United States Army Corps of Engineers
USACHPPM	United States Army Center for Health Promotion and Preventive Medicine
USFWS	United States Fish and Wildlife Service
USFWS BFO	USFWS Bloomington Field Office
UTES	Unit Training Equipment Site

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APPENDIX A

Biological Opinion on the Construction and Operation of the Multi-Purpose Training Range (MPTR) at the Camp Atterbury Army National Guard Training Site, Edinburgh, Indiana

BIOLOGICAL OPINION

on the

CONSTRUCTION AND OPERATION OF THE MULTI-PURPOSE TRAINING RANGE (MPTR) AT THE CAMP ATTERBURY ARMY NATIONAL GUARD TRAINING SITE

EDINBURGH, INDIANA

Submitted to the Military Department of Indiana
December 4, 1998

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INTRODUCTION

This document transmits the U.S. Fish and Wildlife Service's (Service) biological opinion based on our review of the proposed Construction and Operation of the Multi-Purpose Training Range (MPTR) at the Camp Atterbury Army National Guard Training Site, located in Edinburgh, Indiana (Bartholomew, Johnson, and Brown Counties), and its effects on the Indiana bat (*Myotis sodalis*) in accordance with section 7 of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 et seq.). This biological opinion is based on information provided in the August, 1998 Biological Assessment: Effects to Indiana Bats and Bald Eagles from Construction and Operation of the Proposed Multi-Purpose Training Range (hereafter referred to as the biological assessment), the August, 1998 Final Environmental Impact Statement for the Proposed Upgrade of Training Areas and Facilities (FEIS) and additional sources of information. These additional sources include telephone conversations, meetings, and written correspondence with the staff of the Military Department of Indiana (MDI) and the project consultants 3D/International, Inc., Environmental Group (3D/I). Field investigations were also conducted. A complete administrative record of this consultation is on file at the Service's Bloomington, Indiana Field Office (BFO).

CONSULTATION HISTORY

On April 1, 1997 BFO received a copy of the Draft Environmental Impact Statement for the Proposed Upgrade of Training Areas and Facilities (DEIS) for Camp Atterbury, Indiana. Service comments on the DEIS were sent to Atterbury on May 16, 1997. Specifically with reference to endangered species, Service comments indicated that the DEIS did not adequately address potential impacts to the Federally-endangered Indiana bat. The Service noted that Camp Atterbury lies within the known summer maternity range of the Indiana bat and provides suitable habitat for the species; therefore, it was assumed that the species was present on the base and that the proposed action required consultation under the provisions of section 7 of the ESA.

A comprehensive bat survey of Camp Atterbury was conducted in August, 1997. This survey verified the presence of Indiana bats on the base. Based on the distribution of reproductive female and juvenile bats captured, it was estimated that the base supported a minimum of 5 Indiana bat maternity colonies (Montgomery Watson 1997). Adult male Indiana bats were also captured. Based on the results of the survey, MDI initiated plans for conducting an assessment of the effects to Indiana bats from the construction and operation of the proposed MPTR. Staff from MDI, 3D/I (MDI's project consultant), and BFO worked cooperatively to address concerns regarding potential project impacts on Indiana bats. The final biological assessment and request for formal consultation from MDI was received on August 14, 1998. On September 4, 1998, the Service acknowledged receipt of your formal consultation request, and indicated that information required to initiate consultation was included or available; we indicated that this biological opinion would be provided no later than Dec. 27, 1998.

BIOLOGICAL OPINION

DESCRIPTION OF THE PROPOSED ACTION

The action considered in this biological opinion is the preferred alternative identified in the FEIS (Science Applications International Corporation 1998); the alternative is identified as ALTERNATIVE 2C (MPTR). This is the only alternative which was considered in the biological assessment (Montgomery Watson and 3D/I 1998). Detailed descriptions of the proposed action are provided in Section 2 of the biological assessment and in the FEIS; these descriptions are hereby incorporated by reference. A summary follows.

Alternative 2C includes construction of the MPTR in the southwest quadrant of Camp Atterbury with no maneuver corridors (Figure 1). The proposed MPTR will support training for mounted troops and dismounted infantry. Construction limits of the proposed MPTR encompass approximately 190 hectares; within these limits 96 areas are identified for development of firing areas, fixed and moving targets, tank and service roads, and support facilities. Construction of the proposed MPTR requires clearing all trees within the construction boundaries. The action area also includes a Surface Danger Zone (SDZ) comprising 4,367 ha associated with the proposed MPTR. The SDZ delimits an impact area for ammunition fired within the MPTR. Trees in the SDZ within 100 meters of targets may be significantly damaged or destroyed by ammunition fired from the MPTR. Trees greater than 100 meters from targets may occasionally be struck by ammunition.

Proposed training in the MPTR will involve Abrams M1 Tanks, AH-1E/F Attack Helicopters, Bradley Fighting Vehicles, TOW Launch Vehicles, and dismounted infantry. Tanks and other vehicles will fire at both fixed and moving targets. Simulators and colored smoke grenades will be used in some training activities to simulate realistic battlefield conditions. Only training practice rounds will be fired; no high explosive or dud producing rounds will be fired within the MPTR. Pesticides will be applied to small, localized areas of the MPTR for routine maintenance.

Conservation Measures

The following Project Design Features (PDFs) have been incorporated into the project design by MDI; these PDFs are designed specifically to avoid or minimize impacts of the proposed project to summering Indiana bats. The Service has analyzed the effects of the proposed action based on the assumption that all PDFs will be implemented. The detailed descriptions of the PDFs in the biological assessment are hereby incorporated into this biological opinion by reference; a summary follows:

1. Protect selected forest stands to provide suitable Indiana bat summer habitat. Construction

and operation of the MPTR will remove 99.7 hectares of habitat suitable for summering Indiana bats. To minimize the impacts of this habitat loss, Camp Atterbury will set aside 270 hectares, of which 201 hectares are forested, for Indiana Bat Management Zones (Figure 1). Currently, stands in the Indiana Bat Management Zones include mature and early successional forest, and areas vegetated with shrubs and grasses. Indiana Bat Management Zones will be removed from commercial timber rotation. Any silvicultural manipulation will occur outside the Indiana bat summer season (April 15-September 15) and will be limited to activities designed to improve the quality of the stands as bat habitat. To the extent possible, Indiana Bat Management Zones are located adjacent to the proposed MPTR to provide habitat for individual bats that may experience habitat loss associated with the proposed action. Military activities in the zones will remain at current levels and will consist primarily of foot travel, bivouac areas, and SDZs associated with existing ranges and the MPTR. Tracked vehicles will be restricted to existing trails and roads and off-road maneuvering with other vehicles will be minimized.

2. Develop landscape-scale forest management policy. Development of a landscape-scale forest management policy will assist in providing a sustainable source of suitable summer habitat for the Indiana bat. Within one year of the issue date of the biological opinion, Camp Atterbury will describe a desired future condition for forested habitat on the installation. Guidelines for forest management associated with Indiana bat conservation will be described in an ESMP and incorporated into the INRMP. Development of the ESMP and INRMP is the subject of an ongoing section 7 consultation with the Service.

3. Restrict use of training materials potentially causing toxic effects to Indiana bats. Camp Atterbury proposed the use of 44 training materials and four pesticides on the MPTR. An ecological risk assessment (ERA) was conducted to assess which training materials and pesticides may cause adverse effects to Indiana bats. The ERA indicated that the use of AN-M8 smoke grenades may cause toxicological effects to roosting and foraging Indiana bats; to avoid these effects, AN-M8 grenades will not be used on Camp Atterbury. The ERA also indicated that chemicals found in M18 colored smoke grenades may cause acute toxicological effects; Indiana bats roosting within 36 meters of the deployed grenades may inhale unsafe concentrations of M18 colored smoke during a one-minute period following release. Camp Atterbury will minimize effects to Indiana bats by avoiding, to the maximum extent practical, release of M18 colored smoke grenades within 36 meters of trees between 15 April and 15 September. The ERA indicated that the four pesticides will not affect summering Indiana bats unless used improperly. Camp Atterbury will implement guidelines, detailed in the biological assessment, to avoid toxicological effects from pesticides. Camp Atterbury will provide an annual report to the Service to detail the use of M18 grenades and pesticides. The number and location of M18 grenades deployed during the year and during the period April 15-September 15 will be specified in the report. The report will also characterize pesticide applications in terms of types of products used, amounts, locations, dates of applications, and habitats affected by application.

4. Develop and implement a radiotelemetry study. Camp Atterbury conducted a radiotelemetry study to identify Indiana bat roosts and roost habitat on the installation during the summer of 1998; the results of the study are not yet available. The primary goal of the study was to identify existing Indiana bat roost trees and to characterize habitat surrounding existing roost trees. Results of the study will facilitate integration of Indiana bat management into the installation INRMP. Results will also be useful in developing management prescriptions for the Indiana Bat Management Zones.

5. Develop educational programs. Camp Atterbury will provide educational materials and training for military trainers to improve awareness of Indiana bat concerns on the installation. Environmental Awareness training is a component of Camp Atterbury's training program. The Environmental Awareness program is a tool to educate soldiers about the importance of natural resources and environmental compliance; the program will be expanded to include instruction about the Indiana bat.

6. Implement erosion control measures during construction. Camp Atterbury will implement erosion control measures, as detailed in the biological assessment, during construction of the proposed MPTR and associated structures. These measures will minimize the movement of sediment to streams that may provide insect prey for foraging Indiana bats. All erosion and sediment control measures must be established prior to construction or as the first step in construction. The Service will be notified of erosion control measures implemented in the MPTR and may inspect these measures if necessary. Camp Atterbury will monitor erosion and sediment control measures at least once per week to verify proper use. All areas disturbed by construction activities shall be seeded and mulched or sodded and fertilized unless the area is to be paved or built upon.

STATUS OF THE SPECIES

The Indiana bat was officially listed as an endangered species on March 11, 1967 (Federal Register 32[48]:4001) under the Endangered Species Preservation Act of October 15, 1966 (80 Stat. 926; 16 U.S.C. 668aa[c]). The Endangered Species Act of 1973 extended full protection to the species. The Service has published a recovery plan (U.S. Fish and Wildlife Service 1983) which outlines recovery actions. Briefly, the objectives of the plan are to: (1) protect hibernacula; (2) maintain, protect, and restore summer maternity habitat; and (3) monitor population trends through winter censuses. The recovery plan is currently being updated to reflect new information concerning summer habitat use.

Thirteen winter hibernacula (11 caves and two mines) in six states were designated as Critical Habitat for the Indiana bat in 1976 (Federal Register, Volume 41, No. 187). In Indiana, two winter hibernacula are Designated Critical Habitat, including Big Wyandotte Cave in Crawford County and Ray's Cave in Greene County. Neither of these caves are in the vicinity of Camp

Atterbury; the closest, Ray's Cave, is approximately 65 kilometers (km) from Camp Atterbury. Based on censuses taken at hibernacula, the total known Indiana bat population is estimated to number about 352,000 bats. The most severe declines in wintering populations have occurred in two states: Kentucky, where 145,000 bats were lost between 1960 and 1975, and Missouri, where 250,000 Indiana bats were lost between 1980 and 1995. In Indiana populations dropped by 50,000 between the earliest censuses and 1980, but have rebounded to former levels in recent years. Currently, half of all the hibernating Indiana bats in existence (approximately 176,000) winter in Indiana.

A variety of factors have contributed to Indiana bat population declines (U.S. Fish and Wildlife Service 1983). Sometimes their winter hibernacula are flooded, ceilings of the hibernacula collapse, or cold temperatures kill the bats through hypothermia. Exclusion of bats from hibernacula through blocking of entrances, installations of gates that do not allow for bat ingress and egress, disruption of cave air flow, and human disturbance during hibernation have been documented causes of Indiana bat declines. Because many known threats are associated with hibernation, protection of hibernacula has been a management priority.

Despite the protection of most major hibernacula, population declines have continued. Continued population declines of Indiana bats, in spite of efforts to protect hibernacula, have led scientists to the conclusion that additional information on summer habitat is needed (Romme et al. 1995). In addition to increased focus on summer habitat, attention is also being directed to pesticide contamination. Insecticides have been known or suspected as the cause of a number of bat die-offs in North America, including endangered gray bats in Missouri (Clark et al. 1978). The insect diet and longevity of bats also exposes them to persistent organochlorine chemicals which may bioaccumulate in bat tissue and cause sub-lethal effects such as impaired reproduction.

Description and Distribution

The Indiana bat is a medium-sized bat with a head and body length that ranges from 41 to 49 mm. It is a monotypic species that occupies much of the eastern half of the United States, from Oklahoma, Iowa, and Wisconsin east to Vermont, and south to northwestern Florida. The Indiana bat is migratory, and the above described range includes both winter and summer habitat. The winter range is associated with regions of well-developed limestone caverns. Major populations of this species hibernate in Kentucky, Indiana, and Missouri. Smaller winter populations have been reported from Alabama, Arkansas, Georgia, Illinois, Maryland, Mississippi, New York, North Carolina, Ohio, Oklahoma, Pennsylvania, Tennessee, Virginia, and West Virginia. More than 85% of the entire known population of Indiana bats hibernates in only nine caves.

Life History

Generally, Indiana bats hibernate from October through April (Hall 1962; LaVal and LaVal 1980), depending upon local weather conditions. Bats cluster on cave ceilings in densities ranging from 300-484 bats per square foot. Hibernation facilitates survival during winter when prey are unavailable. However, the bat must store sufficient fat to support metabolic processes until spring. Substantial risks are posed by events during the winter that interrupt hibernation and increase metabolic rates.

After hibernation ends in late March or early April, most Indiana bats migrate to summer roosts. Female Indiana bats emerge from hibernation in late March or early April, followed by the males. The period after hibernation but prior to migration is typically referred to as staging. Most populations leave their hibernacula by late April. Migration is stressful for the Indiana bat, particularly in the spring when their fat reserves and food supplies are low. As a result, adult mortality may be the highest in late March and April.

Summering Indiana bats roost in trees in riparian, bottomland, and upland forests. Roost trees generally have exfoliating bark which allows the bat to roost between the bark and bole of the tree. Cavities and crevices in trees also may be used for roosting. A variety of tree species are known to be used for roosts including (but not limited to) silver maple (*Acer saccharinum*), shagbark hickory (*Carya ovata*), shellbark hickory (*Carya laciniosa*), bitternut hickory (*Carya cordiformis*), green ash (*Fraxinus pennsylvanica*), white ash (*Fraxinus americana*), Eastern cottonwood (*Populus deltoides*), northern red oak (*Quercus rubra*), post oak (*Quercus stallata*) , white oak (*Quercus alba*), shingle oak (*Quercus imbricaria*), slippery elm (*Ulmus rubra*), American elm (*Ulmus americana*), sassafras (*Sassafras albidum*), and sugar maple (*Acer saccharum*) (Romme et al. 1995). At one site in southern Indiana, black locust (*Robinia psuedoacacia*) was used extensively by roosting bats (Pruitt 1995). Structure is probably more important than the species in determining if a tree is a suitable roost site; tree species which develop loose, exfoliating bark as they age and die are likely to provide roost sites. Male bats disperse throughout the range and roost individually or in small groups. In contrast, reproductive females form larger groups, referred to as maternity colonies.

Maternity colonies, which may be occupied from mid-May to mid-September, usually contain 100 or fewer adult female bats. Females each give birth to a single young in late June or early July . Young Indiana bats are capable of flight within a month of birth. They spend the latter part of the summer foraging to accumulate fat reserves for the fall migration and hibernation. Maternity colonies occupy roost sites in trees in forested riparian, floodplain, or upland habitats (Romme et al. 1995). Female Indiana bats exhibit strong site fidelity to summer roosting and foraging areas, that is, they return to the same summer range annually to bear their young. Traditional summer sites are essential to the reproductive success of local populations. It is not known how long or how far female Indiana bats will search to find new roosting habitat if their

traditional roost habitat is lost or degraded. If they are required to search for new roosting habitat, it is assumed that this effort places additional stress on pregnant females at a time when fat reserves are low or depleted and they are already stressed from the energy demands of migration.

Indiana bat roosts are ephemeral and frequently associated with dead or dying trees. Most roost trees may be habitable for only 2-8 years (depending on the species and condition of the roost tree) under natural conditions. Gardner et al. (1991a) evaluated 39 roost trees and found that 31% were no longer suitable the following summer, and 33% of those remaining were unavailable by the second summer. A variety of suitable roosts are needed within a colony's traditional summer range for the colony to continue to exist. Indiana bat maternity sites generally consist of one or more primary maternity roost trees which are used repeatedly by large numbers of bats, and varying numbers of alternate roosts, which may be used less frequently and by smaller numbers of bats. Bats move among roosts within a season and when a particular roost becomes unavailable from one year to the next. It is not known how many alternate roosts must be available to assure retention of a colony within a particular area, but large, nearby forest tracts appear important (Callahan 1993). In addition to having exfoliating bark, roost trees must be of sufficient diameter. Trees in excess of 40 cm diameter at breast height (dbh) are considered optimal for maternity colony roost sites, but trees in excess of 22 cm dbh appear to provide suitable maternity roosting habitat. Male Indiana bats have been observed roosting in trees as small as 8 cm dbh.

In Illinois, Gardner et al. (1991b) found that forested stream corridors, and impounded bodies of water, were preferred foraging habitats for pregnant and lactating Indiana bats, which flew up to 2.4 km from upland roosts to forage. Females typically utilize larger foraging ranges than males (Garner and Gardner 1992). Bats forage at a height of approximately 2-30 meters under riparian and floodplain trees (Humphrey et al. 1977). They forage between dusk and dawn and feed exclusively on flying insects, primarily moths, beetles, and aquatic insects. Riparian habitat is occupied by Indiana bats from mid-April to mid-September. Romme et al. (1995) cite several studies which document that Indiana bats also forage in upland forests.

After the summer maternity period, Indiana bats migrate back to traditional winter hibernacula. Some male bats may begin to arrive at hibernacula as early as July. Females typically arrive later and by September numbers of males and females are almost equal. Autumn “swarming” occurs prior to hibernation. During swarming, bats fly in and out of cave entrances from dusk to dawn, while relatively few roost in the caves during the day. By late September many females have entered hibernation, but males may continue swarming well into October in what is believed to be an attempt to breed late arriving females.

Swarming is important to the life history of the bat as most copulation occurs during this time. Females store sperm through the winter and fertilization occurs in the spring. Females are

pregnant when they arrive at the maternity roost. Fecundity is low; female Indiana bats produce only one young per year.

ENVIRONMENTAL BASELINE

Camp Atterbury comprises 13,409 hectares (ha) in portions of Bartholomew (11,397 ha), Brown (1,609 ha), and Johnson (402 ha) Counties, Indiana. The percent of the land area in each of these counties classified as "timberland" is 17%, 66%, and 10%, respectively (Smith and Golitz 1986). The northern third of the installation was glaciated, and is now relatively flat with gently rolling hills. The southern portion has steep slopes and narrow valleys. Camp Atterbury lies within the watershed of the East Fork of the White River, and is drained by Nineveh Creek, Muddy Branch, Lick Creek, Catherine Creek, and Sugar Creek, as well as many small seasonal drainages. Current land use on the installation includes 265 ha of developed cantonment area, 2,474 ha comprise the common impact area and ranges, and the remaining 10,670 ha is divided into 7 training areas.

Approximately 10,927 ha of the base is forested. Forest stand age and density vary, partially due to past land use; prior to construction of the base in 1942, most of the land was used for farming and grazing. Common tree species on the base include oak (*Quercus* spp.), hickory (*Carya* spp.), beech (*Fagus grandifolia*), maple (*Acer* spp.), ash (*Fraxinus* spp.), elm (*Ulmus* spp.), Eastern cottonwood, sycamore (*Platanus occidentalis*), and willow (*Salix* spp.). In addition to the primary function as training areas, forested portions of the installation are managed for multiple uses, including commercial timber harvest, wildlife habitat, protection of unique natural areas, watershed protection, recreation, and aesthetics.

The Indiana Bat at Camp Atterbury

In August 1997, a mist net survey of 22 sites at Camp Atterbury was conducted to determine whether Indiana bats, as well as other bat species, were present on the installation. A total of 208 bats, representing 8 species, was captured, including 13 Indiana bats (Montgomery Watson 1997).

Prior to recent surveys in southern Indiana, it was known that adult male Indiana bats could be found throughout Indiana in summer, but it was unclear if southern Indiana supported maternity colonies of Indiana bats. Summer records of reproductive female or juvenile Indiana bats provide evidence of a nearby maternity colony. There are relatively few records of reproductive female Indiana bats or juveniles from the cave region of Indiana during the summer (Brack 1983, Brack et al. 1987); however, the number of records is growing. At Camp Atterbury, 2 reproductive female and 8 juvenile Indiana bats were captured in 1997. At Jefferson Proving Ground, a closed Army ammunition testing facility in southern Indiana, 9 of 14 Indiana bats captured between 1993-1995 were adult females or juveniles (Pruitt 1995). Whitaker (1994)

captured a lactating female Indiana bat in Jennings County. One reproductive female was also captured at Crane Naval Weapons Support Center during 1998 (Amy Henry, 3D/I., pers. comm.). Tyrell and Brack (1990) reported that there are records for reproductive females or juveniles in Knox, Martin, and Ripley counties. Collectively, these records provide evidence that southern Indiana is clearly within the maternity range of the Indiana bat.

Based on the results of the Camp Atterbury bat survey, it was estimated that the installation supports a minimum of 5 Indiana bat maternity colonies; colonies are distributed across the base (Montgomery Watson 1997). Because Indiana bat maternity colonies may contain up to 100 females and their young, approximately 1,000 Indiana bats (reproductive females and their young) may be present on Camp Atterbury during the summer months. We can not estimate the number of adult males and non-reproductive female bats that may be present. As noted by Montgomery Watson (1997), the estimate of 5 maternity colonies is conservative; additional surveys may yield evidence of additional colonies. Indiana bats were captured at a rate of 0.36 bats per net night at Camp Atterbury; these rates are comparable or higher than those from other recent surveys. Capture rates can not be used to estimate population size. However, the relatively high capture rates, and the fact that capture sites were widely distributed across the installation suggest that Camp Atterbury provides a concentration of suitable Indiana bat summer habitat.

Tyrell and Brack (1990) note that the paucity of records of reproductive female or juvenile Indiana bats in southern Indiana may be due to historic land use practices (i.e. large-scale clearing of forested land) which rendered the habitat unsuitable. They further note that if past land use was responsible for the loss of Indiana bat maternity colonies from the area, then reversion to forest might reverse that loss. The presence of a relatively large concentration of Indiana bat maternity colonies on Camp Atterbury is consistent with this theory. Prior to settlement, the area which now makes up Camp Atterbury was forested, but the majority of the forests were cleared and converted to agricultural use. The land that comprises Camp Atterbury was acquired by the Department of Army (Army), and the installation was constructed in 1942. The installation has largely reverted to forest, even though patches of non-forested vegetation occur throughout the base, while much of the adjoining area remains in agricultural production.

The relatively large block of forested habitat available to Indiana bats at Camp Atterbury is likely advantageous for the species. Callahan (1993) noted: "Larger forest tracts probably increase the chances that a suitable range of roost trees will be present in the stand. Large forest components also provide an additional benefit to a philopatric species that uses an ephemeral resource (snags) for roosting." Kurta et al. (1996) noted that a relatively large area is needed to meet the roosting requirements of Indiana bats; young, highly fragmented forests, typical in the Midwestern United States, can not meet these requirements.

In addition to the size of forest stands, the size of the trees within the stand is also an important

consideration in the suitability of habitat for Indiana bats. Large mature to over-mature hardwood trees are the preferred roosting habitat for Indiana bats. The stands on Camp Atterbury that are managed for commercial timber production are managed on an approximately 120 year rotation (Ron Moore, pers. comm.). This is a relatively long rotation, and allows trees to reach size classes that provide suitable Indiana bat roost sites; however, the availability of roost sites on Camp Atterbury has not specifically been evaluated.

For as long as Indiana bats have been present on Camp Atterbury, they have been exposed to chemicals and sound generated by training materials. They have also been exposed to other disturbances, such as vehicle and foot traffic. Because the base is used intensively for training, it is a reasonable assumption that the home ranges of all bats on the base include at least a portion of an active training area and/or impact area. Indiana bats were captured on active training ranges during the 1997 survey; there is no evidence that Indiana bats abandoned suitable habitat near active ranges. The results of the radiotelemetry study conducted during 1998 may provide additional information on bat movements and habitat use relative to training ranges.

EFFECTS OF THE ACTION

The biological assessment reports field, literature, and ecological risk assessment (ERA) analyses undertaken by the Army to assess the effects of the construction and operation of the MPTR on the Indiana bat. Three general categories of potential effects were identified: 1) effects of habitat modification; 2) toxicological effects of exposure to chemicals in training materials; and 3) effects of sound generated by training activities. Description of the effects of the action, as detailed in the biological assessment and accompanying ERA, is hereby incorporated by reference. A summary, which includes information from the biological assessment and ERA as well as additional comments by the Service, follows.

Effects of Habitat Modification

Construction of the proposed MPTR will require clearing trees within construction boundaries. Operation of the proposed MPTR may result in significant damage from ammunition impacts to trees in the SDZ within 100 meters of targets. Based on the analysis conducted for the biological assessment, it is estimated that these impacts will result in the permanent loss of approximately 99.7 ha of suitable habitat for Indiana bats for summer roosting and/or foraging.

Cutting an Indiana bat roost tree when bats are present in the tree is likely to result in bats being injured or killed. Camp Atterbury will avoid killing or injuring roosting bats by removing trees in the MPTR construction boundary between September 16 and April 14, when Indiana bats are not known to be present on Camp Atterbury.

As previously noted, female Indiana bats establish traditional summer ranges which they return

to annually. It is anticipated that habitat loss associated with the MPTR will result in the loss of some traditional summer roost areas. Loss of traditional roost sites will require females to expend energy locating new roosting habitat when they arrive at Camp Atterbury after migrating from their winter hibernacula. Weight loss and stress associated with hibernation, migration, and pregnancy would be magnified. These stresses could potentially result in lower reproductive success and/or lower survival of juvenile bats. Clearing may also result in alteration of foraging habitat, forcing bats to fly farther to forage. The quality of foraging habitat may also be degraded due to erosion, and subsequent sedimentation of stream corridors, associated with construction and operation of the MPTR. Sedimentation could affect the production of insects associated with aquatic habitats, which make up a portion of the prey base of Indiana bats

Most of the loss of bat habitat associated with construction and operation of the MPTR will be permanent. Bats which are displaced due to clearing in the MPTR will either perish or will establish a new summer home range. The availability of suitable habitat in areas immediately adjacent to the MPTR should enhance the potential for displaced bats to relocate to a new range. To minimize impacts to bats due to habitat loss, Camp Atterbury will set aside 201 hectares of forested habitat into Indiana Bat Management Zones in areas adjoining or in proximity to the MPTR construction boundary. Silvicultural manipulation in Indiana Bat Management Zones will be limited to activities which will enhance the quality of habitat for Indiana bats. While there will be a net loss of Indiana bat habitat associated with construction of the MPTR, habitat quality in Indiana Bat Management Zones, as well as the Old Growth Area and the Protected Natural Areas, should gradually increase over time. Habitat in these areas will remain suitable for Indiana bats indefinitely. Long-term habitat suitability for Indiana bats on Camp Atterbury will also be enhanced through the development of an ESMP and an INRMP which will incorporate Indiana bat management concerns.

Toxicological Effects of Exposure to Chemicals in Training Materials and Pesticides

Operation of the proposed MPTR will include use of training materials and pesticides. Indiana bats may be exposed to training materials and pesticides during the summer maternity season while roosting and foraging. The biological assessment addresses the potential for toxicological effects from exposure to training materials and pesticides.

Information describing 44 training materials and four pesticides proposed for use in the MPTR was gathered for the biological assessment. Each training material and pesticide was evaluated to determine if a complete exposure pathway existed between that item and Indiana bats. Only those materials with complete exposure pathways were considered stressors (i.e. biological or chemical agents that may cause an affect). Exposure was evaluated by Indiana bat age class (adult, juvenile, supplemental nursing pup, and nursing pup) for ingestion, inhalation, and dermal absorption exposure pathways.

The ERA indicated that the four pesticides proposed for use will not affect summering Indiana bats unless used improperly. Camp Atterbury agreed to implement guidelines, detailed in the biological assessment, to avoid toxicological effects from pesticides. With the incorporation of pesticide use restrictions into the project description, effects to Indiana bats are not anticipated.

After evaluating all training materials to be used on the proposed MPTR, AN-M8 grenades and M18 grenades (yellow, green, red, and violet) were identified as potential stressors. Acute and chronic toxicity values were developed for these stressors. The ERA indicated that the use of AN-M8 smoke grenades may cause toxicological effects to roosting and foraging Indiana bats. The Army chose to avoid these effects, and committed to not using AN-M8 grenades on Camp Atterbury. Therefore, potential effects of AN-M8 grenades on bats will not be discussed.

The ERA also indicated that chemicals found in M18 colored smoke grenades may cause acute toxicological effects; Indiana bats roosting within 36 meters of the deployed grenades may inhale unsafe concentrations of M18 colored smoke during a one-minute period following release. Analyses were done based on the assumptions that two grenades will be released on the MPTR on 75 occasions during the period April 15 - September 15 (i.e. a maximum of 150 M18 grenades deployed when bats are present). Using these assumptions, it was concluded in the ERA that the impacts to Indiana bats from exposure to smoke from M18 grenades would be limited to minor, temporary tissue changes, and bats should recover to normal condition within seven days following exposure. Camp Atterbury will minimize effects to Indiana bats by avoiding, to the maximum extent practical, release of M18 colored smoke grenades within 36 meters of trees between April 15 - September 15. The ERA is based on the best information available, but it must be noted that assumptions and uncertainties are inherent in the ERA process. "Uncertainty factors" were applied in attempt to account for some of the uncertainty in the process. For example, the analysis is conservative in that the assumption was made that all grenades would be deployed in the worst possible atmospheric conditions. However, the possibility remains that monitoring could reveal toxicological effects that are not anticipated based on the ERA.

Effects of Sound Generated by Training Activities

The effects of sound generated by training activities on Indiana bats were analyzed in the biological assessment using 2 approaches: 1) Existing data on the auditory capabilities of Indiana bats and similar species were used to evaluate effects of sound generated by proposed training; and 2) Characteristics of sound generated during proposed and past training events were compared using available data.

The analysis in the biological assessment indicated that proposed training in the MPTR will not expose Indiana bats on Camp Atterbury to greater intensity or duration of sound than past training events on the installation. It was assumed that sound intensity and duration associated with past training events did not adversely affect Indiana bats on Camp Atterbury. While this

assumption has not been tested, it is reasonable given the distribution of bats captured on the base. Results of investigation of the effects of sound at Fort Leonard Wood, Missouri also suggest that sound generated by training events (simulated artillery and small-arms fire) do not startle, frighten, or cause bats to flee the area. Radiotelemetric monitoring of Indiana bats near active night training ranges at the Missouri facility indicates that bats do not avoid active ranges or alter foraging behavior during night-time maneuvers (3D/I International, Inc. 1996). Based on the analyses conducted in the biological assessment, it was determined that sound generated by proposed training activities is not likely to adversely affect the Indiana bat. Based on the best information available, we concur with this conclusion.

CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, tribal, local or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

The Service is not aware of any specific State, tribal, local or private actions likely to occur in the vicinity of Camp Atterbury which would affect Indiana bats. The proposed actions would improve the training experience of troops that train at Camp Atterbury rather than increase the number of trainees. Therefore, there are no anticipated changes in demand for off-post housing, public services, or utilities; if such demand existed, this could result in construction in forested areas which could remove roosting and foraging habitat for Indiana bats.

CONCLUSION

After reviewing the current status of the Indiana bat, the environmental baseline for the action area, the effects of the proposed MPTR, and the cumulative effects, it is the Service's biological opinion that the Construction and Operation of the MPTR, as proposed, is not likely to jeopardize the continued existence of the Indiana bat. No critical habitat has been designated for the Indiana bat in the action area; therefore, none will be affected.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibits the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the Service as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

The measures described below are non-discretionary, and must be undertaken by the Army for the exemption in section 7(o)(2) to apply. The Army has a continuing duty to regulate the activity covered by this incidental take statement. If the Army fails to assume and implement the terms and conditions the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the Army must report the progress of the action and its impact on the species to the Service as specified in the incidental take statement [50 CFR §402.14(i)(3)].

AMOUNT OR EXTENT OF TAKE

The Service anticipates that incidental take of Indiana bats will occur in the form of harm through habitat loss and potentially through exposure to toxicological agents used in the operation of the MPTR. Based on our knowledge of the ecology of Indiana bats, and the distribution of Indiana bats on Camp Atterbury, we assume that the habitat that will be lost will affect the roosting and foraging habitat of 1 maternity colony of Indiana bats. We further assume that this colony would be composed of approximately 200 bats (100 reproductive female Indiana bats and 100 young of the year). Additionally, roosting and foraging habitat would be impacted for an unknown number of adult male and non-reproductive adult female Indiana bats.

It is unlikely that direct mortality of bats will be detected, that is, we do not expect that dead or moribund bats will be found. Behavioral or physiological effects which impair reproduction and recruitment, or other essential behavioral patterns are anticipated; there is no practical means to directly measure these impacts to bats. Therefore, the anticipated level of take is expressed as the permanent loss of 99.7 ha of forest, as designated in the biological assessment, that is currently suitable summer roosting and foraging habitat for Indiana bats and that will be cleared for the construction and operation of the MPTR at Camp Atterbury. Exposure to chemicals found in

M18 colored smoke grenades may cause acute toxicological effects to Indiana bats, but is not expected to result in take if the reasonable and prudent measures are implemented.

EFFECT OF THE TAKE

In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the species or destruction or adverse modification of critical habitat.

REASONABLE AND PRUDENT MEASURES

The Service believes the following reasonable and prudent measures are necessary and appropriate to minimize take of Indiana bats:

Minimize Impacts on Indiana Bat Summer Roosting and Foraging Habitat

1. Develop Indiana Bat Management Zones near areas to be cleared for the MPTR. The availability of suitable habitat in areas near the MPTR should enhance the potential for displaced bats to relocate to a new range, thus minimizing the take of bats associated with the habitat that will be lost.

2. Implement erosion control measures during construction and operation of the MPTR. Regarding potential for erosion during construction of the MPTR, the FEIS states: "Sedimentation could be severe enough such that destruction of habitat for bottom-dwelling organisms and gravel-spawning fish, and degradation of water quality are sufficient to cause extensive acute mortality and jeopardize local populations of all aquatic biota." In addition, steep slopes within the MPTR create concerns regarding the potential for erosion during operation of the MPTR.

3. No trees will be felled within the MPTR construction boundaries during the Indiana bat reproductive season (April 15 through September 15) to avoid injuring or killing bats by felling a roost tree when bats are present.

4. Develop a base-wide forest management plan which incorporates Indiana bat management concerns. Base-wide management will enhance long-term suitability of summer habitat on Camp Atterbury.

Minimize and Monitor Toxicological Effects of Training Materials on Indiana Bats

1. AN-M8 smoke grenades will not be used on Camp Atterbury.

2. Implement guidelines to minimize toxicological impacts of M18 colored smoke grenades on Indiana bats.

3. Implement guidelines to minimize toxicological impacts of pesticides used for maintenance of the MPTR on Indiana bats.

4. Initiate investigation to assess the potential for M18 colored smoke grenades to cause injury to Indiana bats at Camp Atterbury, if results of biomonitoring of bats at Fort Leonard Wood, Missouri indicate that the grenades potentially have a greater impact on bats than predicted based on the ERA.

Develop educational programs

Camp Atterbury will provide educational materials and training for military personnel to improve awareness of Indiana bat concerns on the installation.

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the Act, the Army must comply with the following terms and conditions, which implement the reasonable and prudent measures described above and outline required reporting/monitoring requirements. These terms and conditions are non-discretionary.

1. Provide an annual report to the Service. MDI will provide an annual report to the Service's BFO detailing each year's activities related to implementation of the reasonable and prudent measures. Annual reports will be provided by November 30 of each year, beginning in 1999. Some required elements of the annual report (as detailed in the following terms and conditions) include: a) an evaluation of habitat quality in the Indiana Bat Management Zones and details regarding management activities implemented in the zones; b) an update on the status of erosion monitoring and control programs; c) details on the annual use of M18 colored smoke grenades; d) a characterization of pesticide applications; and e) assessment of Camp Atterbury's efforts to incorporate materials related to Indiana bats into the Environmental Awareness training program.

2. Indiana Bat Management Zones. The Army has already incorporated the designation of Indiana Bat Management Zones as a Project Design Feature (PDF) of the proposed project; specific areas to be designated (Figure 1) were indicated in the biological assessment. Silvicultural manipulation in Indiana Bat Management Zones will be limited to activities intended to enhance summer habitat for Indiana bats, and will be developed in consultation with and approved by the Service. Every 3 years while the MPTR is in operation, the Army will evaluate Indiana bat habitat quality in the Indiana Bat Management Zones. The first evaluation period should take place before the MPTR becomes operational. Procedures for evaluating bat habitat

quality will be developed by the Army and approved by the Service within 1 year of the receipt of this biological opinion. The outcome of the habitat evaluation in the bat management zones will be included in Camp Atterbury's annual report to the Service. Based on the evaluations, the Service and the Army will cooperatively develop management prescriptions to be implemented in the Indiana Bat Management Zones. Any management activities implemented will be reported in the annual report

3. Erosion control measures. During construction of the MPTR, Camp Atterbury will implement the erosion control measures that were designated in the biological assessment as a PDF. Camp Atterbury will also develop procedures to monitor and control erosion during operation of the MPTR. An erosion monitoring and control plan, approved by the Service, should be in place at least 60 days prior to the MPTR becoming operational.

4. Base-wide forest management plan. Camp Atterbury is currently developing a forest management plan designed to maintain or enhance the quality of the Indiana bat habitat on the installation; this plan is being developed in consultation with the Service. Until the plan is complete, MDI will consult with the Service on a project-by-project basis for any project involving manipulation of woody vegetation on the base.

5. Minimize toxicological impacts of M18 colored smoke grenades within the MPTR. Implement guidelines within the MPTR to minimize toxicological impacts of M18 colored smoke grenades on Indiana bats, including:
a) As designated in the biological assessment, a maximum of 150 M18 grenades will be deployed (annually) during the Indiana bat reproductive season (April 15 - September 15).
b) As designated in the biological assessment, avoid to the maximum extent practical the release of M18 colored smoke grenades within 36 m of trees between April 15 - September 15.
c) As designated in the biological assessment, Camp Atterbury will provide an annual report to the Service which will indicate the number and location of M18 colored smoke grenades deployed during the year and during the period April 15 - September 15. Reporting on location should include the approximate number of M18 grenades deployed within 36 m or less of trees during the bat reproductive season.
d) Newly formulated red and violet grenades (which will contain less toxic dyes) are currently being developed. As soon as these newly formulated grenades become available, Camp Atterbury will discontinue use of current red and violet grenades and utilize the less toxic alternatives.
e) After using an M18 colored smoke grenade, the grenade canister and any residual materials in the canister will be collected and disposed of properly as soon as practical within the context of the training being conducted.

6. Camp Atterbury will use results of biomonitoring conducted at Fort Leonard Wood, Missouri to evaluate potential toxicological effects of M18 colored smoke grenades to Indiana bats.

During January through March 1999-2003, Camp Atterbury will review results presented in annual reports prepared by Fort Leonard Wood and submitted to the Service as required by the Terms and Conditions in the Biological Opinion/Take Statement for Base Realignment and Closure activities at Fort Leonard Wood. Chemical analyses of surrogate bat tissue (whole body analyses), gross anatomical and histopathological tissue analyses of surrogate bat lung tissue, chemical analyses of guano, and chemical analyses of fish and sediment shall be reviewed. If detectable amounts of terephthalic acid (TPA) or lung damage are noted in samples collected at Fort Leonard Wood, but not in samples collected at reference sites, Camp Atterbury shall initiate an investigation to assess the potential for M18 colored smoke grenades to cause injury to Indiana bats at Camp Atterbury. A draft study plan for investigating effects of M18 colored smoke grenades shall be submitted to and approved by the Service at least 60 days prior to initiation of the proposed study.

7. Implement guidelines, as detailed in the biological assessment, to minimize toxilogical impacts of pesticides used for maintenance of the MPTR on Indiana bats. Camp Atterbury will characterize pesticide applications in terms of types of products used, amounts, locations, dates of application, and habitats affected in the annual report provided to the Service. No pesticides other than the 4 assessed in the ERA (Roundup, Oust, Kibosh, Bactimos Briquets) will be used on the MPTR without first assessing potential impacts to Indiana bats and consulting with the Service.

8. Camp Atterbury will provide educational materials and training for military personnel to improve awareness of Indiana bat concerns on the installation. The training program should be in place prior to the MPTR becoming operational. To the maximum extent practical, all troops that use the MPTR should be provided with information on Indiana bats. A copy of written training materials relative to Indiana bats should be provided to the Service, and a summary of training activities should be included in the annual report provided to the Service.

9. Any dead bats located on Camp Atterbury, regardless of species, should be immediately reported to BFO [(812) 334-4261], and subsequently transported on ice to that office. No attempt should be made to handle any live bat, regardless of its condition; report bats that appear to be sick or injured to BFO. BFO will make a species determination on any dead or moribund bats found on the base. If an Indiana bat is identified, BFO will contact the appropriate Service Law Enforcement office.

In conclusion, the Service believes that no more than 99.7 ha of forest that is currently suitable summer roosting and foraging habitat for Indiana bats will be permanently lost in the area cleared for the construction and operation of the MPTR at Camp Atterbury. In addition, if a maximum of 150 M18 colored smoke grenades are used annually during the period when bats may be present (April 15 - September 15), we anticipate that the effects to Indiana bats from exposure to the grenades will be limited to acute toxicological effects. The reasonable and prudent measures,

with their implementing terms and conditions, are designed to minimize the impact of incidental take that might otherwise result from the proposed action. If, during the course of the action, this level of incidental take is exceeded (i.e. more than the 99.7 ha designated in the biological assessment is cleared or more than 150 colored smoke grenades are used during the period April 15 - September 15), such incidental take represents new information requiring reinitiation of consultation and review of the reasonable and prudent measures provided. The Army must immediately provide an explanation of the causes of the taking and review with the Service the need for possible modification of the reasonable and prudent measures.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

The Service provides the following conservation recommendations for Camp Atterbury; these activities may be conducted at the discretion of MDI as time and funding allow:

1. Conduct a radio telemetry study of Indiana bats within the action area to assess the movements and habitat use of bats relative to training.

2. Expand on educational materials and management techniques related to Indiana bats developed for Camp Atterbury, and coordinate with other Army reserve force training areas to develop materials to be used at facilities throughout the range of the Indiana bat. The purpose of this effort would be to: 1) provide guidance for facilities on management activities designed to enhance Indiana bat habitat on training areas, and 2) develop educational materials to be used on military training areas that will promote awareness of Indiana bats and lessen the potential for adverse impacts to bats as a result of training activities.

In order for the Service to be kept informed of actions for minimizing or avoiding adverse effects or benefitting listed species or their habitats, the Service requests notification of the implementation of any conservation recommendations.

REINITIATION NOTICE

This concludes formal consultation on the Construction and Operation of the Multi-Purpose Training Range (MPTR) at the Camp Atterbury Army National Guard Training Site, as outlined in the biological assessment received with your August 14, 1998 request. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency

involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the construction and operation of the MPTR may affect listed species in a manner or to an extent not considered in this opinion; (3) the construction and operation of the MPTR is subsequently modified in a manner that causes an effect to listed species not considered in this opinion, such as the addition of a training material which was not considered in the ERA; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation. Requests for reinitiation, or questions regarding reinitiation, should be directed to BFO.

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NOTE: FIGURE WILL BE REPRODUCED IN COLOR FOR THE FINAL BIOLOGICAL OPINION

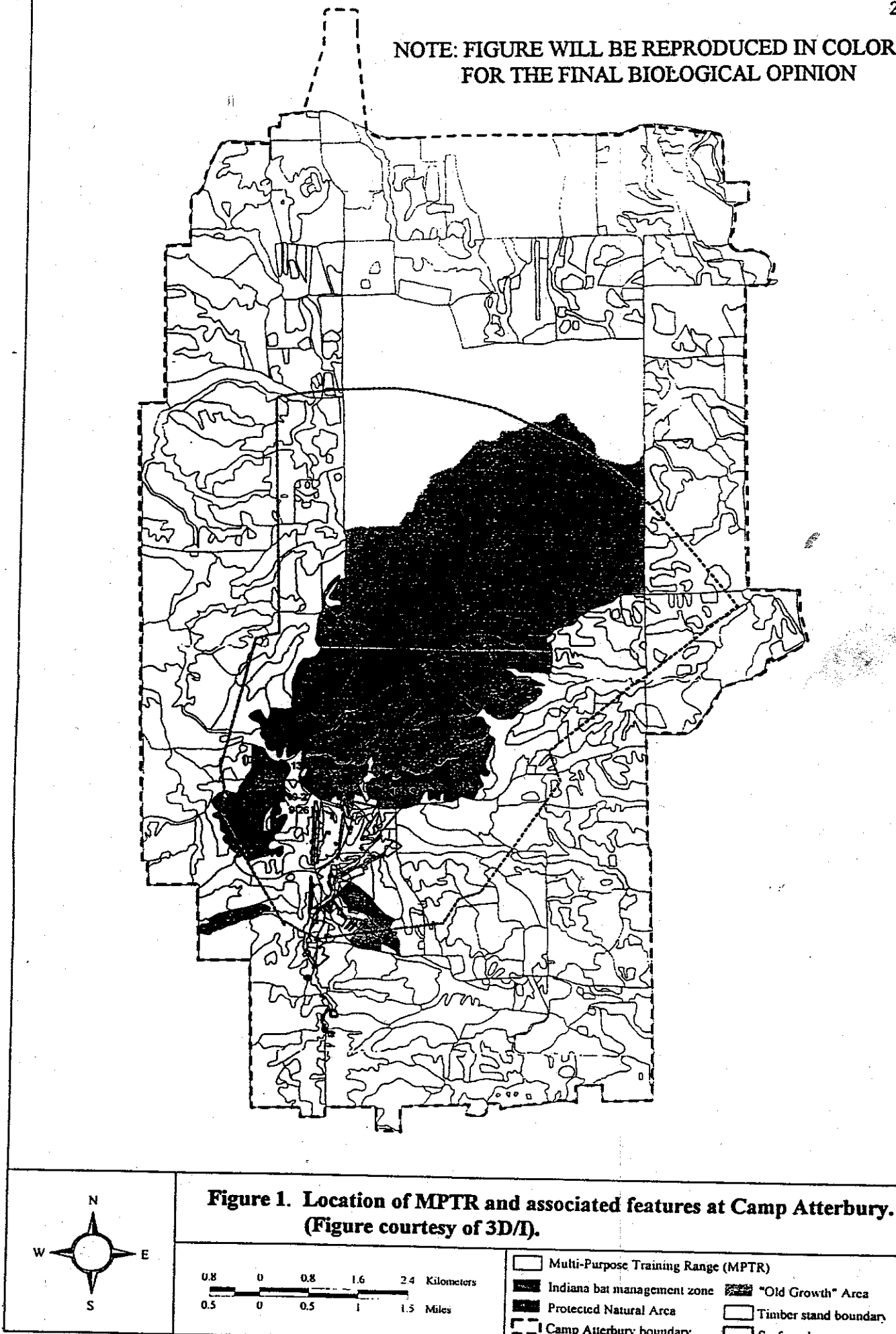

Figure 1. Location of MPTR and associated features at Camp Atterbury. (Figure courtesy of 3D/I).

APPENDIX B

Ranges and Munitions Used at Camp Atterbury

Table B-1
Ranges and Munitions Used at Camp Atterbury

Range Number (if listed) and Number	Weapons Used
1. Woodfill Multi-use	M16 25m Zero, M16 25M Alt Crs "C" M16 NBC, M16 Night Fire, M60 10m Zero, M249 10m Zero, Pistol, .38 cal, 45 cal & 9mm
2. Woodfill Police	45 Cal & 9mm Police Tactics, 5.56 Police Tactics Shotgun Practice, Swat House Tactics
3. Woodfill KD-1	M16 25m Zero M15 30m Zero M16 Army/Marine Courses Shotgun Practice M24/M86 Sniper Practice, Sniper Snaps & Movers NRA High Power Matches
4. Woodfill KD-2	M16 25m Zero, M16 30m BZO, M16 Army/Marine Courses Shotgun Practice, M24/M86 Sniper Practice Sniper Snaps & Movers NRA High Power Matches 81mm SRTR
5. Woodfill KD-3	M16 Army/Marine Courses, Shotgun Practice, M24/M86 Sniper Practice Sniper Snaps & Movers NRA High Power Matches 81mm SRTR
6. Woodfill KD-4	M16 Army/Marine Courses Shotgun Practice M25/M86 Sniper Practice Sniper Snaps & Movers NRA High Power Matches Sniper Unknown Distance M60 LMG
7. Woodfill 203-TP	40mm TP Practice 40mm TP Qualify
8. Woodfill 203-HE	40mm HE Practice

Table B-1
Ranges and Munitions Used at Camp Atterbury

Range Number (if listed) and Number	Weapons Used
9. Michael Pistol East	45 Cal & 9mm 25m AQPC, 45 Cal & 9mm 7/15/25yd Shotgun Practice M3 Machine gun
10. Michael Combat Pistol	45 Cal & 9mm Combat Course Night Fire Course
11. Michael Multi-Purpose MG	M249/M60/M2 Training Practice/Qualification M24 Sniper Practice/Qualification Sniper Unknown Distance M249/M60 Night Practice/Qualification
12. Michael Multi-Use	M16 25m Zero M16 25mm Alt Crs "C" M16 NBC M16 Night Fire M60 10m Zero M249 10m Zero 45 Cal & 9mm, 25m AQPC
13. Michael 3	M16 25m Zero M16 25 m Alt Crs "C" M16 NBC M16 Night Fire 9 (adjusted) M60 10m Zero M249 10m Zero M2 10m Zero 45 Cal & 9mm 25m AQPC
14. Michael Record Fire	M16 Record Fire Qual M16 Battle Site Zero M16 Auto Fire M16 Feedback 75/175/300
15. McGee 81mm Sabot	81mm Sabot Practice
16. McGee Subcal Light Antiarmor Weapon (LAW)	35mm SubCal Practice
17. Practice Hand Grenade	Hand Grenade Qualification (TP only)
18. McGee Record Fire	M16 Record Fire Qualification M16 Battle Site Zero M16 Auto Fire M16 Feedback 75/175/300 M16 Night Fire

Table B-1
Ranges and Munitions Used at Camp Atterbury

Range Number (if listed) and Number	Weapons Used
19. McGee Light MG	M16 25m Zero M16 25m Alt Crs "C" M16 NBC M60 20m Zero M249 10m Zero M2 10m Zero (Plastic) 45 Cal & 9mm 25m AQPC Shotgun Practice
20. McGee Heavy MG	M16 25m Zero M16 25m Alt Crs "C" M16 NBC M16 Night Fire (adjusted) M60 10m Zero M2 10m Zero 45 Cal & 9mm, 25m AQPC 60mm Mortar (track & ground) 25mm Bradley Practice Shotgun Practice
21. McGee 10/25	M16, 25m Zero M16 25m Alt Crs "C" M16 NBC M16 Night Fire (adjusted) M60 10m Zero M249 10m Zero 45 Cal & 9mm 25 m AQPC 60mm Mortar (track & ground) Shotgun Practice
22. McGee Recoilless Rifle	M16, 25m Zero M16 25m Alt Crs "C" M16 NBC, M16 Night Fire (adjusted) M60 10m Zero M249 10m Zero 45 Cal & 9mm 25 m AQPC 60mm Mortar (track & ground) Shotgun Practice 84mm AT-4 Practice 66mm LAW & 202 Flash Practice 83mm SMAW Practice 105/155/203 Arty direct fire 165m CEV TP Only Dragon MK-19 40mmm HE & TP

Table B-1
Ranges and Munitions Used at Camp Atterbury

Range Number (if listed) and Number	Weapons Used
23. McGee LAW	Claymore 84mmm At-4 Practice 66mm LAW & 202 Flash Practice 83mm SAW Practice 40mm M203 HE Practice
24. Mcgee Heli-gunship	20mm & 30mm Helicopter guns 40mm TP nose cannon 2.75 rockets TP 7.62mm mini-gun Claymore Aerial TOW
25. Wilder Machine Gun	M60 Trans Practice/Qualification M24 Sniper Practice/Qualification Sniper Unknown Distance M60 Night Practice/Qualification
26. Tipton Tank	105/29mm (TP) 50 Cal Field Fire Mounted Inbore .50 Cal (Table VII) MK-19 40mm (TP only) 1200m Zero Sniper Unknown Distance
30. MP-15	TOW TP (ground & vehicle) Dragon MK-16 40mm HE & TP Squad Defense live fire M16, M60, M203, LAW, Flash
38. Hickham Door Gunner Range	M60 Door-gunner Practice M134 Minigun Side-mount Day & Night
43. Lick Creek Platoon Assault	M16 M60 M203 TP 3.5 Subcal LAW
44. Heavy Demolition	40lb Max charge, elect & non-elect charged
52. Light Demolition	1 1/5lb Max charge, elect & non-elect charged
53. Practice Hand Grenade	Hand Grenade Qualification (TP only)
54. Live Hand Grenade	M67 Fragmentation Practice (HE)

Table B-1
Ranges and Munitions Used at Camp Atterbury

Range Number (if listed) and Number	Weapons Used
SRTR Range	81mm SRTR
Squad Technique of Fire	M16 M60 M203 TP 3.5 Subcal LAW/99mm AT4 TT
3B Squad Assault	M16 M60 M203 TP
4B Squad Assault	3.5 Subcal LAW/9mm AT4 TT
6BW Squad Assault	M16 M60 M203 TP
6BE Squad Assault	M16 M60 M203 TP
Medical Litter Course	Expert Field Medical Badge certified
Rappelling Tower(s)	Sheer wall side (35') Steel tower (45') Two ramp sites Helicopter skid side
Conditioning Course	Training or Competitive 16 stations 9 station air assault
NBC Chamber (2 room)	Mask Confidence Platoon Size
Still water bridge site	Engineer float bridge training
M-COFT site	Fenced Area
TSFO Trainer	Classroom seats
Helicopter Sling Loads	Equipment loads
Land Navigation Courses	Practice, Beginner, Intermediate and Advanced Courses

Table B-1
Ranges and Munitions Used at Camp Atterbury

Range Number (if listed) and Number	Weapons Used
Drop Zones Anderson Klieber Smith Smith Circular Bouden Larkin Larkin Reverse Robinson Hickham	Air Force-certified
4100 ft tactical strip	Certified year-around C-130

Source: SAIC, 1998; INARNG, 1999.

APPENDIX C

Annual Reports to the U.S. Fish and Wildlife Service

1012.026

September 2001

2000 Annual Report: Implementation of Reasonable and Prudent Measures & Terms and Conditions in the Biological Opinion for BRAC Implementation at Fort Leonard Wood

Submitted to:

United States Department of the Interior
Fish and Wildlife Service
Ecological Services
Columbia Field Office
608 East Cherry Street, Room 200
Columbia, Missouri 65201

Submitted by:

Fort Leonard Wood
Fort Leonard Wood, Missouri 64106

Prepared by:

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11733 Chesterdale Road
Cincinnati, Ohio 45246
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Summary

This report documents actions in 2000 to implement and complete portions (Reasonable and Prudent Measures – RPMs and T&Cs – Terms and Conditions) of the 1997 Biological Opinion (BO) issued by the U.S. Fish and Wildlife Service (FWS) regarding Baseline Realignment and Closure Act (BRAC) activities on Fort Leonard Wood (FLW), Missouri. Studies described within this report were completed to determine the presence of certain contaminants in:

- surrogate bats for Indiana bats (*Myotis sodalis*) and gray bats (*Myotis grisescens*),
- guano from five caves used by Indiana bats and gray bats,
- surrogate birds for bald eagles (*Haliaeetus leucocephalus*),
- fish taxa available as prey for bald eagles, and
- sediments from Roubidoux Creek and Big Piney River.

In addition to collection of samples for the contaminant analyses, several other studies were conducted:

- Histopathological examination of bat and bird lungs. Lungs from bats and birds were removed and examined to identify histopathological abnormalities that may be present in their lungs after exposure to chemicals associated with the BRAC action.
- Population counts of Indiana bats hibernating on the Installation, gray bats in maternity caves, and wintering bald eagles. Results from monitoring winter populations of Indiana bats and bald eagles and populations of gray bats present on the Installation in maternity colonies in the summer are included.
- Collection of bat, bird, and fish tissue and sediment samples from both off-Installation (reference) and on-Installation (exposure) sites. There are no reference sites for the caves where the guano samples were taken.

Results presented herein are the first year monitoring after the implementation of the BRAC action. Results reported in the 1998 and 1999 are baseline and were generated prior to the execution of the BRAC action. Data presented in the Annual Reports prepared to satisfy portions of the Ongoing Mission BO requirements are baseline also in regards to the BRAC action. Certain results from the ongoing mission studies are presented within this report to satisfy Conservation Recommendation (CR) No. 1 of the BRAC BO.

One hundred and thirty-four bats were captured during spring and fall mist netting. Eight species of bats were captured. Six gray bats were captured during spring mist netting and none were captured during the fall. No Indiana bats were captured during 2000. None of the bats analyzed for contaminants had unusual concentrations of the chemicals assessed. The contaminants predicted to have potential to affect the bats were terephthalic acid (TPA) and polycyclic aromatic hydrocarbons (PAHs), both of which are found in fog oil. Because little is known about the pharmacokinetics of PAHs that are produced from fog oil smoke or their environmental behavior, two additional analyses were completed on bat, bird, and fish samples: Cytochrome P450 analysis on the liver tissue and analysis of PAH metabolites in the gall bladder (or liver tissue if the specimen lacks a gall bladder). Several of the bats were also assessed to determine the body burden of selected pesticides as recommended in CR No. 1 and RPM No. 1 of the Ongoing Mission BO.

Fifty-five bat samples were collected and analyzed for the presence of PAHs. Data from four of the samples was not included in the results as a consequence of a blank that was contaminated during analysis. None of the bat samples collected on FLW had concentrations of PAHs that were greater than those of the samples from reference sites. Most of the bats sampled had a low concentration of naphthalenes (several methylated isomers), biphenyls, phenanthrene, fluoranthene, and pyrene. The range of the total PAHs was 32.0 ng/g (ppb) to 993.0 for the bats collected from the exposure sites and 100.0 ng/g to 2010.0 ng/g for bats collected at the reference sites.

Bile from the gall bladders of thirty-six of the bats collected during 2000 were analyzed for the presence of PAH metabolites. The concentrations of the PAH metabolites determined for the samples indicated that the bats were excreting some PAH breakdown products. The concentration of the metabolites ranged from undetected (MDL = 0.001 µg/g) to 47.83 µg/g (ppm)

for benzo(a)pyrene, undetected to 33.48 µg/g for pyrene, 1.41 µg/g to 3156.96 µg/g for phenanthrene, and 8.5 µg/g to 207,75.00 µg/g for naphthalene.

Livers of thirty-six bat samples collected in 2000 were analyzed to determine if there was an increase in the amount of Cytochrome P450 using the Human Reporter Gene System (HRGS) technique. The amount of induction of the HRGS is directly correlated to exposure to planar organic compounds. The degree of induction is related to a concentration of benzo(a)pyrene [B(a)Peq)] that would illicit the amount of induction. The induction values are reported as equivalents (concentrations) of organic compounds the bat may have been exposed to in order to have the amount of induction. Concentrations of B(a)Peq of bats collected on FLW in 2000 ranged from 9.07 µg/g to 1399.1 mg/g µg/g. Concentrations of B(a)Peq for bats collected at reference sites ranged from 11.8 µg/g to 1022.7 µg/g.

Thirty-one bats were collected and analyzed to assess the presence of TPA in their tissue. Eight of the samples were accidentally destroyed in the laboratory during the extraction process. Low concentrations (at or near the detection limit of 0.001 mg/L) of TPA were detected in eight of the 23 samples. The concentration of TPA detected in the bat samples collected during 2000 is potentially from a biogenic source. An improved analytical method for TPA analyses first utilized in 1999, and used in 2000 appears to have reduced some of the biogenic TPA interference. Additional extraction materials and methods will be utilized in 2001 analyses to help improve the recovery of TPA, which should provide better results.

Forty-one of the bat samples collected during 2000 were analyzed for the presence of pesticides. All the samples were screened for organochlorine and organophosphate pesticides. None of the bat samples analyzed in 2000 had detectable concentrations of either Dursban or Malathion, pesticides used by FLW. Several of the bat samples analyzed in 2000 had detectable concentrations of DDE, DDT, chlordane, dieldrin, and heptachlor epoxide. Concentrations of DDE in the bats were greater than those determined for DDT as expected. Concentrations of pesticides detected in bat tissues samples in 2000 were similar to those determined for samples analyzed in 1999, 1998, and 1997. Several bat samples had extremely large concentrations of DDE that exceed values reported for bats presumed to have been killed by pesticides.

Lungs from bats collected and submitted for gross histopathological examination during 2000 were normal. While a few of the bat lung samples had an increased number of

macrophages and eosinophilic pollen granules as expected in wild populations, there were no unusual findings.

Guano was collected from six caves on FLW during 2000: Saltpeter No. 3, Davis No. 2, Freeman, Joy, Wolf Den, and Brooks caves. Guano samples were assessed for the presence of PAHs, TPA, and pesticides. Mean concentrations of total PAHs ranged from 0.030 µg/g to 0.250 µg/g. There were no unusual PAHs detected in guano samples that were not detected in bat, bird, or fish tissue samples. Concentrations of PAHs detected in guano samples collected in 2000 were similar to those in samples from 1999 and do not appear to be of concern. Concentrations of TPA in guano samples collected during 2000 ranged from non-detectable (MDL = 0.005) to 0.0703 µg/g. It is likely that TPA detected in guano samples collected during 2000 is not from chemicals used for military training but rather from another biogenic source or metabolic by-product. Neither of the two pesticides (Dursban and Malathion) used on FLW were detected in the guano samples. Five pesticides were detected in the guano samples: DDT, DDE, Dieldrin, heptachlor, and heptachlor epoxide. Concentrations of pesticides in guano samples collected and analyzed in 2000 were very low and close to the detection limit (0.001 µg/g).

Several of the training materials used as part of the BRAC action were predicted to have potential to affect bald eagles. Rather than evaluate bald eagles directly, surrogate birds that inhabit the same area on the Installation where bald eagles occur were sampled. Fifty birds (12 species) were captured during 2000. Chemical analyses were conducted on 44 of the 50 specimens. As with bat samples analyzed in 2000, none of the birds analyzed for contaminants had unusual concentrations of the chemicals assessed. The contaminants predicted to have potential to affect bald eagles by ingestion and inhalation were TPA and PAHs found in fog oil. Due to a lack of detailed scientific data on the pharmacokinetics of PAHs, two additional analyses were completed on bat, bird, and fish samples: Cytochrome P450 analysis on the liver tissue and analysis of PAH metabolites in the gall bladder (or liver tissue if the specimen lacks a gall bladder). Several of the birds were also assessed to determine the body burden of selected pesticides as recommended in CR No. 1 for bats.

Twenty-two of the bird samples collected during 2000 were analyzed for the presence of PAHs. Concentrations of total PAHs were similar in bird samples collected on FLW and at off-site reference locations. Most of the birds sampled had low concentrations of naphthalenes (several methylated isomers), biphenyls, phenanthrene, fluoranthene, and pyrene. The range of the total

PAHs was 21.2 to 898.0 ng/g for the birds collected from the exposure sites and 17.6 to 80.7 ng/g for birds collected at the reference sites.[comment: 80 vs. 898 seems worthy of additional comment here especially as the high number was on-site]

Portions of the livers of twenty-two birds collected in 2000 were assessed to determine the concentration of PAH metabolites. The concentrations of the PAH metabolites determined for the samples indicated that the birds are excreting PAH metabolic byproducts. No benzo(a)pyrene (five ringed metabolites) or pyrene (4 ringed metabolites) were detected in the bird samples analyzed during 2000. The concentration of the metabolite equivalents detected ranged from 0.013 to (MDL = 0.001 µg/g) to 38.349 µg/g (ppm) for naphthalene and 0.307 to 14.780 µg/g for phenanthrene and were similar regardless of where the bats were collected.

Livers of twenty-two bird samples collected in 2000 were composited into eight samples and then analyzed for Cytochrome P450 activity using the HRGS technique. Concentrations of B(a)Peq in birds collected on FLW in 2000 ranged from 10.90 µg/g to 68.7 µg/g. The concentrations of B(a)Peq assessed in birds collected in 2000 was less than concentrations determined for bat livers. The birds have been exposed to some hydrocarbon, however the source is unknown, but present on FLW and at the reference sites.

Twenty-two birds were collected and analyzed for the presence of TPA in their tissue. TPA was detected in low concentrations in most of the bird samples, with the mean of the samples collected at exposure and reference sites being similar (0.004 and 0.003 mg/L, respectively). TPA in the bird samples is potentially from a biogenic source. An improved analytical method for TPA analyses first utilized in 1999, and used in 2000 appears to have reduced some of the biogenic TPA interferences. It is believed that the oils on the feathers interfere with the extraction of TPA from the bird tissue. The oily material from bird feathers extracts with other methanol soluble compounds, such as TPA and may inhibit the separation of TPA in the extract solution. Therefore, bird samples analyzed in 2001 include TPA analysis of the samples with and without feathers. Several different extraction procedures were tried in order to increase the percent recovery rate of matrix-spiked samples on bird and bat samples collected during 2000. Removal of the feathers and comparison of samples with and without feathers should help increase the percent recovery of TPA.

Twenty-two bird samples were analyzed for the presence of pesticides. All the samples were screened for organochlorine and organophosphate pesticides. None of the bird samples

analyzed in 2000 had detectable concentrations of either Dursban and Malathion. Several of the bird samples analyzed had detectable concentrations of DDE, DDT, dieldrin, and heptachlor epoxide. Concentrations of detectable pesticides in most of the bird samples were at or near the detection limit of the analyses.

Lungs from birds collected and submitted for gross histopathological examination during 2000 were mostly normal. Several of the lung samples had an increased number of macrophages and common parasites found in wild populations. There were no unusual findings from this analysis.

Several of the military training materials used as part of the BRAC action were shown to have potential to affect bald eagles, if ingested. To assess the accumulation of these materials in bald eagle prey and their prey's habitat on the Installation, fish and sediment samples were collected from the Roubidoux Creek and Big Piney River at locations on the FLW and in the Mark Twain National Forest. One hundred and sixty-nine fish (eight species) were captured during 2000 and composited into 44 samples. The contaminants that were predicted to have potential to affect bald eagles were TPA and PAHs. In order to provide a better determination of the distribution of the PAHs in fish, two additional analyses were completed on fish samples: Cytochrome P450 analysis on the liver tissue and analysis of PAH metabolites in the gall bladder. Several of the fish samples were also assessed to determine the body burden of selected pesticides.

Twenty-four of the fish samples collected during 2000 were analyzed for the presence of PAHs. All of the fish samples had detectable concentrations of PAHs. The samples collected at the Roubidoux Creek reference site had the greatest mean total PAH concentration (156 ng/g), compared to the mean of the total PAH concentrations of samples collected at the Roubidoux Creek exposure site (43.7 ng/g), Big Piney River exposure site (56.2 ng/g (ppb), and the Big Piney River reference site (55.7 ng/g). Most of the fish sampled had a low concentration of naphthalenes (several methylated isomers), biphenyls, phenanthrene, fluoranthene, and pyrene.

Bile from the gall bladders of twelve of the fish collected during 2000 were analyzed for the presence of PAH metabolites. The concentrations of the PAH metabolites determined for the samples indicate that fish excrete PAH breakdown products. No five ring (benzo(a)pyrene equivalents) or four ring (pyrene) PAH equivalents were detected (MDL = 0.001 µg/g) in any of the 12 fish samples. The concentration of the metabolites ranged from 5.08 to 186.482 for

phenanthrene and 5.040 to 32.369 µg/g for naphthalene. Concentrations of PAH metabolites were similar in fish samples collected on and off the Installation.

Livers of twenty-four of the fish samples collected in 2000 were analyzed to determine if there was an increase for Cytochrome P450 activity (HRGS technique). The amount of induction of the HRGS is directly correlated to exposure to planar organic compounds. The degree of induction is related to a concentration B(a)Peq that would illicit the amount of induction. The induction values are reported as equivalents (concentrations) of organic compounds the fish may have contacted (been exposed to) to have the amount of recorded induction. Concentrations of B(a)Peq of fish collected on FLW in 2000 ranged from 8.2 to 106.2 µg/g. Concentrations of B(a)Peq for fish were less than those determined in livers from bats and birds.

Twenty of the fish samples collected in 2000 were analyzed to assess the presence of TPA in their tissue. TPA was detected in low concentrations (at or near the detection limit 0.001 mg/L) in eleven of the twenty fish samples and was detected in samples collected on the Installation and at the reference sites. TPA in the fish samples is potentially from a biogenic source, and an improved analytical method for TPA analyses first utilized in 1999, and used again in 2000 appears to have reduced some of the biogenic TPA interferences in fish sample. Additional extraction materials and methods will be utilized in 2001 analyses to help improve the recovery of TPA, which would improve detection levels.

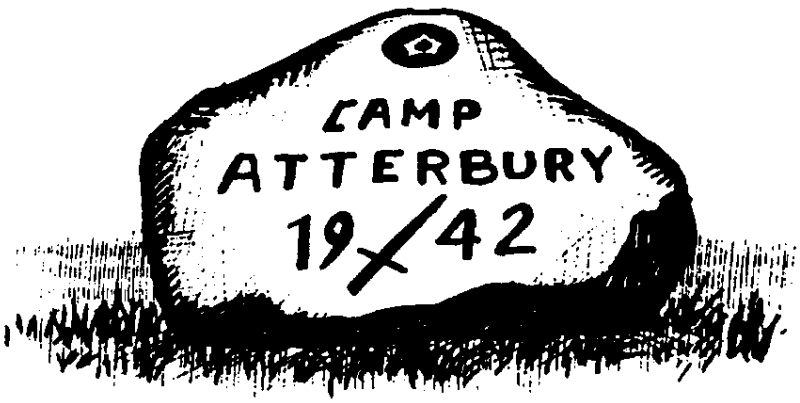
Twenty-four of the fish samples were analyzed for the presence of pesticides. All the samples were screened for organochlorine and organophosphate pesticides. None of the fish samples analyzed in 2000 had detectable concentrations of either Dursban or Malathion. Sixteen of the fish samples had detectable concentrations of DDE. A few of the fish samples had detectable concentrations of DDT, DDD, chlordane, dieldrin, and heptachlor epoxide. Concentrations of pesticides in the fish samples were less than the concentrations measured in previous years.

Sediment samples were collected from areas where bald eagles and bats forage. Determination of the contaminants in these samples will allow an estimation of their accumulation in habitats where bat and bald eagle prey occurs. Twenty samples were collected from Roubidoux Creek and Big Piney River exposure and reference sites (five from each) during 2000. The samples were analyzed for TPA, PAHs, and pesticides. Twelve of the sediment samples were analyzed for PAH content. All concentrations measured in the sediment samples with detectable

PAHs were at or near the detection limit with the exception of perylene and pyrene. These two PAHs were identified in the laboratory blanks (reagent and procedural) and their quantification is questionable. All sediment samples assessed in 2000, contain small quantities of PAHs. Total PAH concentrations of the sediment samples (including the samples contaminated with perylene and pyrene) ranged from 1.28 to 73.8 µg/g. All twelve of the sediment samples analyzed for the presence of TPA had detectable concentrations at or near the detection limit (detection limit = 0.001 µg/g). The concentrations of TPA ranged from 0.001 to 0.003. It is unlikely that TPA is present in sediment based upon the percent recovery of matrix spike samples (22%) and the values measured being at or near the detection limit. Because the extraction procedure used for separation of TPA from the sediment, also removes other organic acids (similar in structure to TPA), the TPA detected may be another compound that extracts along with TPA. Twelve sediment samples were analyzed to determine the concentration of pesticides. Only one sample had any detectable pesticides; DDE was detected in one sample from Big Piney River reference site. All other values of pesticides assessed in sediment samples collected during 2000 were below detection limit.

This report also summarizes surveys for wintering bald eagles completed in January 2000 on and near FLW. Twenty-five bald eagles (17 adults and 8 immatures) were observed on or around FLW. Results of this survey were similar to those of previous surveys.

FY 1999 Annual Report
to the
U.S. Fish and Wildlife Service



Indiana Bat Management Activities
at
Camp Atterbury

Prepared by:
The Military Department of Indiana,
Environmental Management Division

INDIANA BAT MANAGEMENT ZONES.

No action has taken place in the management zones. No harvests are planned within the zones. Requirements stipulate that "procedures for evaluating bat habitat quality will be developed by the Army and approved by the Service within 1 year of the receipt of this biological opinion". Efforts have been initiated to develop these procedures as part of the Installation Integrated Natural Resource Management Plan (INRMP). Request the Bloomington Field Office provide assistance in determining procedures for habitat evaluation.

EROSION CONTROL MEASURES.

A salvage timber sale was conducted to clear merchantable trees from the MPTR area. Operations began January 8, 1999 with the last tree removed April 17, 1999. The sale was officially closed September 27, 1999 after a claim for metal contamination was settled and erosion control requirements were met. Indiana BMP's were implemented, except for seeding of landing areas, which was deemed unnecessary since construction was to begin very soon. Water bars were installed on all skid trails of any slope. The area was already heavily regenerated by late summer.

Construction of the MPTR began October 4, 1999. The contractors have installed erosion control devices as required in the contract.

M18 SMOKE GRENADE USAGE.

	GREEN	YELLOW	RED	VIOLET
OCT 98	63	23	16	10
NOV 98	0	0	1	0
DEC 98	0	0	0	0
JAN 99	0	3	2	1
FEB 99	15	14	4	0
MAR 99	39	58	3	53
APR 99	85	62	7	54
MAY 99	82	80	13	46
JUN 99	41	9	20	11
JUL 99	147	167	22	85
AUG 99	0	9	0	5
SEP 99	10	10	0	45
TOTAL	**482**	**435**	**88**	**310**

Smoke Grenade usage is not confined to a specific area of the installation. It is not possible to determine location in which the grenades were used. Soldiers are briefed prior to training of the requirement to be 36 meters from wooded areas when using smoke grenades.

PESTICIDE USAGE.

No pesticides were used on the MPTR or in Bat Management Zones during Fiscal Year 1999. Seventy pounds of glyphosate (Roundup) herbicide and two and one half pounds of sulfometuron methyl (Oust) herbicide were used on the northern Camp Atterbury boundary fencelines and interior Cantonment area fencelines. Three pounds of Plateau (trademark) herbicide and fifteen and one-eighth pounds of Oust herbicide were used in native grass planting in an open field drop zone in Training Area 2B. Two hundred and twenty pounds of glyphosate (Accord) herbicide were used on an open field in Training Area 1A where trees are to be planted. Five pounds of Copper Sulfate algaecide were used in the man-made pond within the World War II memorial on the Camp's Northern Boundary.

The following insecticides were used within and on buildings in the Cantonment Area; .125 pounds propetamphos (Safrotin), Golden Jet Bee Spray, .45pounds malathion, .04 pound dichlorvos, and .006 pound pyrethrins.

No pesticides were used near known bat roosting areas. No pesticides were used within 100 feet of a stream unless labeled for that purpose (glyphosate is labeled for this). No insecticides were used outside of the Cantonment Area. Personal protection pesticides such as OFF were not tracked, will not be tracked, and were used all over the Camp. Personal troop fogging generators were used in the training areas, as necessary. Troops were instructed not to use these within 100 feet of any trees or streams. These foggers are small consumer appliances available at most hardware stores and use pesticides labeled for normal consumer use.

ENVIRONMENTAL AWARENESS TRAINING.

The Environmental Office conducted training for ROTC students at Ball State prior to field training exercises at Camp Atterbury and as part of their required Environmental training. The training covered generic environmental requirements as well as Camp Atterbury specific issues. Included is a portion on endangered species with emphasis on the Indiana Bat at Camp Atterbury.

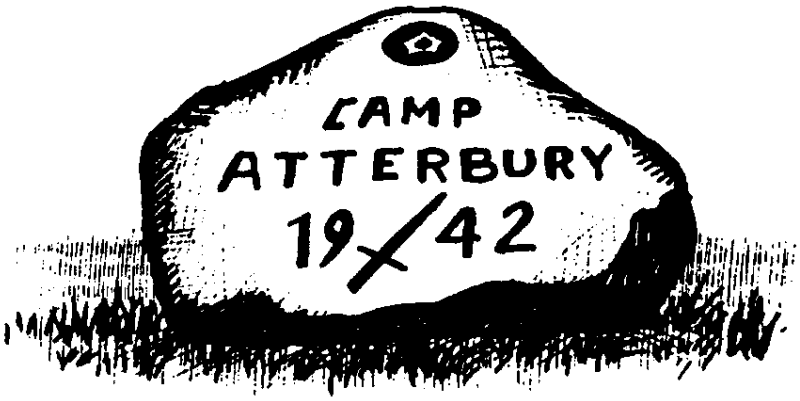
We also conduct Environmental training for Non-Commissioned Officers (NCO) attending Advanced NCO training conducted at Camp Atterbury annually. Instruction is focused on Camp Atterbury and emphasizes measures to protect Indiana Bats and habitat such as no tree cutting, ensuring tracked vehicles remain on trails, and use of M18 smoke grenades.

Unit representatives are required to attend a ”keep off the grass” meeting conducted on Fridays at Range Control on Camp Atterbury. All units are required to have a senior ranking individual (Officer or NCO) present at the briefing prior to training on Camp Atterbury. The briefing covers all environmental requirements to include measures to protect Indiana bats and their habitat.

MDI is currently in the process of contracting with a firm that can produce a poster series and pamphlets that will be distributed to all units throughout the state to raise awareness of the Indiana bat. Copies of the final products will be provided to the USFWS.

The Environmental Management Division is working with the MDI Public Affairs Office to develop an environmental awareness section to be included in each issue of the "Guardsman" magazine, a quarterly publication distributed to all members of the Indiana National Guard. The section will include various environmental issues to include the Indiana Bat.

FY 2000 Annual Report
to the
U.S. Fish and Wildlife Service



Indiana Bat Management Activities
at
Camp Atterbury

Prepared by:
The Military Department of Indiana,
Environmental Management Division

This report documents actions in fiscal year 2000 to implement portions of the 1998 Biological Opinion (BO) issued by the U.S. Fish and Wildlife Service (FWS) regarding construction and operation of the multi-purpose training range at Camp Atterbury, Indiana.

Construction has begun on the range. Based on the current schedule, the expected completion date and the earliest the range would be in operation is January 2003.

INDIANA BAT MANAGEMENT ZONES.

Due to updated Tank Gunnery Standards, additional timber will removed from the MPTR to accommodate repositioning of the targets. A portion of this area is within the designated Bat Management Zone. No clearing will be conducted between April 15 and September 15. An amendment to the biological opinion was issued by the USFWS on 6 November providing for additional set asides in the northeastern portion of the installation to compensate for the additional timber removed from the original Bat Management zone. The amendment also requires Camp Atterbury to construct water sources in the designated bat management zones to improve the quality of the habitat.

Requirements stipulate that "procedures for evaluating bat habitat quality will be developed by the Army and approved by the Service within 1 year of the receipt of this biological opinion". Efforts have been initiated to develop these procedures. It continues to be the opinion of the Natural Resources section that the designated area is not quality habitat for summer maternity roosting due to the absence of lowland species such as cottonwood (large areas of slipping bark) for maternity roost trees and the absence of water in the area. The oak-hickory woodland would appear to be sufficient for alternate roosting only. MDI, in coordination with the BFO, will provide a draft habitat management plan to the USFWS, BFO, by 1 March 2001.

EROSION CONTROL MEASURES.

A salvage timber sale was conducted to clear merchantable trees from the MPTR area. Operations began January 8, 1999 with the last tree removed April 17, 1999. The sale was officially closed September 27, 1999 after a claim for metal contamination was settled and erosion control requirements were met. Indiana BMP's were implemented, except for seeding of landing areas, which was deemed unnecessary since construction was to begin very soon. Water bars were installed on all skid trails of any slope. The area was already heavily regenerated by late summer.

Actual construction activities began October 4, 1999 and have been moving along rapidly. The Atterbury environmental staff discovered that the contractors were open burning tree residue in violation of the contract and IDEM requirements. This was immediately rectified. The contractors have also installed erosion control devices as required in the contract and installed several catch basins. The area south of Hickham Rd. has been seeded and in good shape. The area between 83rd Division Road and Hickham is more recent construction and has not yet been seeded. The Natural Resources Section will continue to monitor this area.

M18 SMOKE GRENADE USAGE.

	GREEN	YELLOW	RED	VIOLET
Total FY 99	551	458	169	166

Camp Atterbury's Ammunition Supply Point was not able to provide a break down by month by the report deadline due to deployments and other requirements. If a breakdown by month is required, it can be provided at a later date. The percent of total expended per month should be approximately the same as last year with the majority (approximately 75%-80%) expended between April and October.

Smoke Grenade usage is not confined to a specific area of the installation. It is not possible to determine location in which the grenades were used. Once the MPTR is operational, locations of smoke grenade deployments within the MPTR will be provided as part of this report. Soldiers are briefed prior to training of the requirement to be 36 meters from wooded areas when using smoke grenades.

MDI is researching the use of and evaluating the potential impacts of M83 smoke grenades, a less toxic replacement for the HC smoke grenade no longer in use on Camp Atterbury.

PESTICIDE USAGE.

No pesticides were used on the MPTR or in Bat Management Zones during Fiscal Year 1999. 9.594 pounds of glyphosate (Roundup) herbicide and 1.125 pounds of sulfometuron methyl (Oust) herbicide were used on the Camp Atterbury boundary fencelines and interior Cantonment area fencelines.

The following insecticides were used within and on buildings in the Cantonment Area; .25 oz. of propetamphos (Safrotin) and .005 oz. of methoprene.

No pesticides were used near known bat roosting areas. No pesticides were used within 100 feet of a stream unless labeled for that purpose (glyphosate is labeled for this). No insecticides were used outside of the Cantonment Area. Personal protection pesticides such as OFF were not tracked, will not be tracked, and were used all over the Camp. Personal troop fogging generators were used in the training areas, as necessary. Troops were instructed not to use these within 100 feet of any trees or streams. These foggers are small consumer appliances available at most hardware stores and use pesticides labeled for normal consumer use.

ENVIRONMENTAL AWARENESS TRAINING.

We are continuing with our Environmental training for Non-Commissioned Officers (NCO) attending Advanced NCO training conducted at Camp Atterbury annually. Instruction is focused on Camp Atterbury and emphasizes measures to protect Indiana Bats and habitat such as no tree cutting, ensuring tracked vehicles remain on trails, and use of smoke grenades.

Unit representatives are required to attend a ”keep off the grass” meeting conducted on Fridays at Range Control on Camp Atterbury. All units are required to have a senior ranking individual (Officer or NCO) present at the briefing prior to training on Camp Atterbury. The briefing covers all environmental requirements to include measures to protect Indiana bats and their habitat, smoke grenade usage. Leaders are also instructed to immediately contact the environmental office on Camp Atterbury or the Staff Duty Officer after duty hours if they encounter an injured or dead bat.

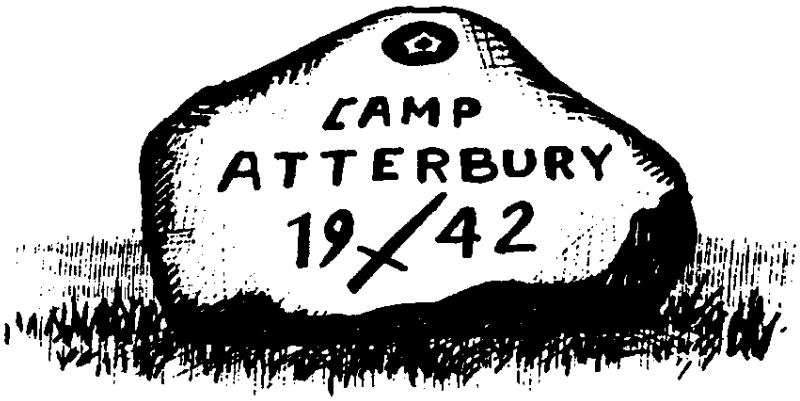
The MDI Environmental Management Division is working with Aqua-Terr, LLC to develop additional educational material, posters and a video to address various natural resource issues with emphasis on the Indiana bat and other state-listed species present on Camp Atterbury. Aqua-Terr has developed environmental awareness videos and material for several military installations. Soldier field cards have been updated to reflect the Indiana bat

RESULTS OF BIOMONITORING AT FORT LEONARD WOOD.

The Biological Opinion requires Camp Atterbury to review results of biomonitoring at Ft. Leonard Wood (FLW), Mo. to evaluate the potential toxicological effects of M18 colored smoke grenades to Indiana bats. Camp Atterbury will also review results presented in annual reports prepared by FLW and submitted to the USFWS as required by the Terms and Conditions in the Biological Opinion/Take Statement for Base Realignment and Closure activities at FLW.

Review of the reports submitted for the last two years by FLW indicate low concentrations of TPA in most bat samples, including those from reference sites, and one guano sample. According to the report, TPA is believed to potentially be from a biogenic source. Camp Atterbury will continue to monitor result from FLW. At this time we do not believe further investigation is warranted. A summary of the FLW reports is attached.

FY 2001 Annual Report
to the
U.S. Fish and Wildlife Service



Indiana Bat Management Activities
at
Camp Atterbury

Prepared by:
The Military Department of Indiana,
Environmental Management Division

This report documents actions in fiscal year 2001 to implement portions of the 1998 Biological Opinion (BO) issued by the U.S. Fish and Wildlife Service (FWS) regarding construction and operation of the multi-purpose training range at Camp Atterbury, Indiana.

Construction has begun on the range. Based on the current schedule, the expected completion date and the earliest the range would be in operation is January 2003.

INDIANA BAT MANAGEMENT ZONES.

Due to updated Tank Gunnery Standards, additional timber was removed from the MPTR. A portion of this area was within the Bat Management Zone. Camp Atterbury revised the 'Take' permit in conjunction with the BFO, USFWS. Additional set-aside areas were added to the BMZ in coordination with and approval from BFO. A salvage timber sale was conducted to clear the required areas and was completed in FY 01 prior to 15 April in compliance with Indiana bat management measures.

Three ponds were planned for construction within the IBMZs to provide water to improve bat habitat. One was completed and is holding water. Two others have been cleared in preparation for construction and are planned to be completed in FY 02. The ponds will also serve as an emergency water source for fire protection of the MPTR with the installation of dry hydrants at each of the ponds.

EROSION CONTROL MEASURES.

All salvage timber sale operations were completed in FY 01 with the necessary erosion control measures implemented. Ground construction activities on the MPTR are continuing with the expected completion date of November, 2002. Additional work such as target installation will be conducted after construction completion. Actual use of the range is not expected until 2003 or later. MPTR contractual requirements for erosion control have been implemented, such as seeding, but not always successful due to timing outside optimal planting periods. Check dams have been constructed where necessary.

TRAINING AREA FOREST MANAGEMENT

The INRMP was completed in October and is being implemented. Two managed timber harvests were marked in the summer of 2001 under INRMP and Indiana bat management requirements. These harvest areas lie adjacent to the IMBZ and are being conducted, in part, to remove trees prior to possible metal contamination of the stand when the MPTR goes on line; the areas are behind MPTR targets. BFO was consulted on the sales and visited the area. It was found that a requirement of leaving the three largest trees of the various species set forth was not necessarily accomplished and was found to be practically impossible to implement. The BFO approved the marking for these harvests but standards must be discussed prior to future harvests to work out practical stand marking procedures. The Natural Resources Section will submit suggestions for BFO approval to rectify this for future general training area timber harvesting.

M18 SMOKE GRENADE USAGE.

	GREEN	YELLOW	RED	VIOLET	SCREENING SMOKE*	TOTAL
Total FY 01	38	319	652	279	96	1,384
Total Apr-Sep	21	244	461	185	75	986

Smoke Grenade usage is not confined to a specific area of the installation. It is not possible to determine locations in which the grenades were used. Once the MPTR is operational, locations of smoke grenade deployments within the MPTR will be provided as part of this report. Soldiers are briefed prior to training of the requirement to be 36 meters from wooded areas when using smoke grenades.

MDI is researching the use of and evaluating the potential impacts of M83 smoke grenades, a less toxic replacement for the HC smoke grenade no longer in use on Camp Atterbury. Studies conducted at Ft. Leonard Wood have not indicated any affects on bats from the use of M83 grenades. Very low levels of TPA were found in guano samples collected at Ft. Leonard Wood. It is believed that the TPA detected is from a biogenic source or metabolic by-product rather than military training activities. For more information, see the Ft. Leonard Wood summary reports attached.

Screening smoke* are grenades fired from vehicles such as tanks and armored personnel carriers. The grenades are chemically similar to the other colored smoke grenades.

PESTICIDE USAGE.

No pesticides were used on the MPTR or in Bat Management Zones during Fiscal Year 2001. The following pesticides were used in the Cantonment Area and on the ranges.

HERBICIDES:
Glyphosate:
18.167 gallons (72.668 pounds of active ingredient) of glyphosate in it's isopropylamine salt form (Roundup liquid) herbicide and 37.5 oz. (1.67 pounds of active ingredient) of glyphosate (Roundup-dry) in it's ammonium salt form were used for weed control on the firing ranges and in the cantonment area.

INSECTICIDES:
Malathion:
312oz Claire Golden Jet Wasp Killer (0.39 pounds malathion) was used to control wasp nests on the firing ranges.

Chlorpyrifos:
2 pounds Spartan Wasp Spray (0.005 pounds Chlorpyrifos) was used to control wasps in the cantonment area.

ALGAECIDES:
Copper Sulfate:
27.9 Pounds copper sulfate crystals (27.621 pounds copper sulfate) were used to control algae in the isolated memorial pond.

CONTRACTOR APPLIED PESTICIDES:
Termiticides:
10 baits containing Recruit (0.009 pounds hexaflumeron) used around the museum in the Cantonment area to control termites.

Flea Treatments:
3 oz. Suspend (0.01 pounds suspend) used in cantonment area buildings.
4.5 oz. Nylar IGR (0.0037 pounds pyradine) used in cantonment area buildings.

General occasional pest treatments on Mockingbird Hill house in Cantonment area:
46 Generation Blocks used (0.00014 pounds difethialone) for control of mice.
160ml Tempo SC Ultra used (0.042 pounds Cyflutherin) for control of occasional pests.

No pesticides were used near known bat roosting areas. No pesticides were used within 100 feet of a stream unless labeled for that purpose (glyphosate is labeled for this). No insecticides were used outside of the Cantonment Area. Personal protection pesticides such as OFF were not tracked, will not be tracked, and were used all over the Camp. Personal troop fogging generators were used in the training areas, as necessary. Troops were instructed not to use these within 100 feet of any trees or streams. These foggers are small consumer appliances available at most hardware stores and use pesticides labeled for normal consumer use.

ENVIRONMENTAL AWARENESS TRAINING.

We are continuing with our annual Environmental training for company commanders, Non-Commissioned Officers (NCO) and soldiers. Instruction is focused on Camp Atterbury and emphasizes measures to protect Indiana Bats and habitat such as no tree cutting, ensuring tracked vehicles remain on trails, and use of smoke grenades.

Unit representatives are required to attend a ”keep off the grass” meeting conducted on Fridays at Range Control on Camp Atterbury. All units are required to have a senior ranking individual (Officer or NCO) present at the briefing prior to training on Camp Atterbury. The briefing covers all environmental requirements to include measures to protect Indiana bats and their habitat, smoke grenade usage. Leaders are also instructed to immediately contact the environmental office on Camp Atterbury or the Staff Duty Officer after duty hours if they encounter an injured or dead bat.

The environmental staff also provides an environmental awareness brieifing to all new company commanders

RESULTS OF BIOMONITORING AT FORT LEONARD WOOD.

The Biological Opinion requires Camp Atterbury to review results of biomonitoring at Ft. Leonard Wood (FLW), Mo. to evaluate the potential toxicological effects of M18 colored smoke grenades to Indiana bats. Camp Atterbury will also review results presented in annual reports prepared by FLW and submitted to the USFWS as required by the Terms and Conditions in the Biological Opinion/Take Statement for Base Realignment and Closure activities at FLW.

Review of the reports submitted for 2000 by FLW indicate low concentrations of TPA in most bat samples, including those from reference sites, and one guano sample. According to the report, TPA is believed to potentially be from a biogenic source. Camp Atterbury will continue to monitor result from FLW. At this time we do not believe further investigation is warranted. A summary of the FLW reports is attached.

APPENDIX D

Agency Correspondence

United States Department of the Interior

FISH AND WILDLIFE SERVICE
BLOOMINGTON FIELD OFFICE (ES)
620 South Walker Street
Bloomington, Indiana 47403-2121
(812) 334-4261 FAX 334-4273

IN REPLY REFER TO

June 13, 1997

Mr. Ronald E. Moore
Natural Resources Manager
Camp Atterbury
Building #1, Hospital Road
Edinburgh, IN 46124-1096

Dear Mr. Moore:

This is the U.S. Fish and Wildlife Service's (FWS) response to your letter of 16 May 1997. In that letter, you requested: 1) specific recommendations on management of the Federally endangered Indiana bat (*Myotis sodalis*) on Camp Atterbury to incorporate into the Camp Atterbury Integrated Natural Resources Management Plan; 2) FWS comments on the potential to use the Record of Environmental Decision and Army National Guard Environmental Checklist as a basis for determining whether or not threatened and endangered species consultation is required under Section 7 of the Endangered Species Act (ESA) for construction projects on Camp Atterbury; and 3) comments on the draft Cooperative Plan, outlining cooperation between the Army, the Indiana Department of Natural Resources (IDNR), and the FWS, that will be incorporated into the Integrated Natural Resources Management Plan.

FWS response to items 1 and 3 are covered in this letter. We can not yet respond to item 2 (as we have already informed you on the phone), as the copies of the Record of Environmental Decision and Army National Guard Environmental Checklist which you originally forwarded for review were not complete. Complete copies of these documents were received at the FWS Bloomington Field Office (BFO) this week; we will forward our review when it is completed.

In addition to the aforementioned requests, during the meeting between the Army, IDNR, and FWS on 14 May, Major Newlin, Camp Atterbury Facility Engineer, requested that the FWS review the bat survey specifications prepared by the Camp Atterbury staff. Our review of that document is also included in this letter.

These comments have been prepared under the authority of the Fish and Wildlife Coordination Act (16 U.S.C. 661 et seq.) and are consistent with the intent of the National Environmental Policy Act of 1969, the Endangered Species Act of 1973, and FWS Mitigation Policy.

INDIANA BAT GUIDELINES FOR FOREST MANAGEMENT ON CAMP ATTERBURY

These are the guidelines discussed during the 14 May meeting on Camp Atterbury. A group of FWS biologists from throughout the range of the Indiana bat are currently developing Indiana bat management guidelines for Federal agencies which carry out large scale forest management programs (e.g. U.S. Forest Service, Bureau of Land Management, Military areas). The following interim guidance is largely the result of that ongoing process.

The following interim guidelines for Camp Atterbury are recommended until a comprehensive bat survey of the installation is completed and more detailed management recommendations are possible.

Percent Overstory Canopy Cover

At least 60% canopy cover should be maintained after any timber harvest activities.

Roost Tree Densities

1. No harvest of shagbark hickory (*Carya ovata*) or shellbark hickory (*Carya laciniosa*) trees.

2. No harvest of trees > or = 9" diameter at breast height (dbh) that have 10% or more exfoliating bark.

3. If criteria 2 results in less than 14 trees per hectare (ha), the difference should be made up by live trees > 16" dbh of the following species:

silver maple (*Acer saccharinum*)
bitternut hickory (*Carya cordiformis*)
green ash (*Fraxinus pennsylvanica*)
white ash (*Fraxinus americana*)
eastern cottonwood (*Populus deltoides*)
northern red oak (*Quercus rubra*)
post oak (*Quercus stallata*)
white oak (*Quercus alba*)
slippery elm (*Ulmus rubra*)
American elm (*Ulmus americana*)
black locust (*Robinia pseudoacacia*)

Riparian Corridor

1. No cutting within 100 feet on both sides of a perennial stream and within 50 feet on both sides of an intermittent stream.

2. Do not girdle trees to create snags in the riparian corridor.

In addition to these timber management considerations, we also need to discuss the Camp Atterbury firewood program, which we have not previously discussed. Firewood cutting programs can impact Indiana bats because trees selected for firewood frequently have potential as Indiana bat roost trees.

BAT SURVEY REVIEW

During our meeting on 14 May, Major Newlin, Camp Atterbury Facility Engineer, requested that the FWS review the bat survey specifications prepared by the Camp Atterbury staff. Our review of that document follows.

Under the **REQUIREMENTS** section of the bat survey specifications, we recommend that you reference the Indiana Bat Recovery Team's "Guidelines for Netting Bats," which we previously provided (another copy is attached). The survey should be conducted according to the recovery team's recommended methodology, and should conform to the "minimum level of effort" guidelines.

We recommend that item "G" in the **REQUIREMENTS** section of the bat survey specifications, referring to the collection of voucher specimens, be dropped. Collection of voucher specimens of Federally threatened or endangered species will not be permitted, and we discourage the routine collection of voucher specimens of any species during bat surveys.

We recommend that you incorporate provisions for radio tracking if Indiana bats are captured on the base. Radio telemetry could be used to track the bats and delineate roosting and foraging habitat. Information on roosting and foraging habitat would be extremely valuable in assessing the impacts of the proposed activities on the base.

If you have additional questions regarding survey specifications or Federal permitting requirements, contact Scott Pruitt at BFO ((812) 334-4261 x 217). Potential contractors may also contact Scott if they have questions.

COMMENTS ON THE DRAFT COOPERATIVE PLAN

Our major comment on the draft of the cooperative plan is that we recommend clarification regarding threatened and endangered species. Army Regulation 200-3, Chapter 11, Endangered/Threatened Species Guidance states: "The Army is committed to being a national leader in conserving listed species. DA personnel at all levels must ensure that they carry out mission requirements in harmony with the requirements of the Endangered Species Act (ESA) of 1973, sections 1531 to 1544, title 16, United Stated Code (16 USC 1531-1544). Mission requirements do not justify actions violating the ESA. All Army land uses, including military training, testing, timber harvesting, recreation, and grazing, are subject to ESA requirements for the protection of listed species and critical habitat."

Item 3 in the draft Cooperative Plan for Camp Atterbury outlines discretionary programs "for the development and management of fish and wildlife resources on Camp Atterbury," that will be "subject to the requirement of the military mission at Camp Atterbury and associated agricultural outleasing and timber management programs...". We recommend that this section of the plan should reflect a distinction between discretionary programs for fish and wildlife management, versus programs that address threatened and endangered species concerns, as mandated by the ESA and Army regulation.

BEAVER POND MANAGEMENT

In addition to the aforementioned responses to your requests for information, also enclosed is an article on "The Clemson Beaver Pond Leveler," as discussed at the meeting and tour of Camp Atterbury on 14 May. The technique outlined in this article has been effective in many situations in Indiana. It may allow you to reduce flooding problems associated with beaver ponds at Camp Atterbury, while maintaining some of the benefits derived from the beaver-created wetlands.

If you have any questions or require additional technical assistance, please contact Lori Pruitt at (812) 334-4261, extension 211.

Sincerely yours,

David C. Hudak
Supervisor

2 attachments

Use this copy. 9/98

DRAFT

WORKING NOTES ON INDIANA BAT GUIDELINES FOR FOREST MANAGEMENT

Note that these guidelines will result in habitat that is **suitable but generally less than optimal** for Indiana bats.

FOREST MANAGEMENT GUIDELINES

1. At least 60% canopy cover (on a stand-by-stand basis, depending on size of stands) maintained after any timber harvest activities

2. Shagbark hickory (*Carya ovata*) or shellbark hickory (*Carya laciniosa*) trees shall not be harvested or manipulated during timber stand improvement (TSI) activities.

3. No snag removal, except where they pose a serious human safety hazard.

4. The following species of trees have been identified as having relatively high value as potential Indiana bat roost trees:

shagbark hickory (*Carya ovata*)
shellbark hickory (*Carya laciniosa*)
bitternut hickory (*Carya cordiformis*)
silver maple (*Acer saccharinum*)
green ash (*Fraxinus pennsylvanica*)
white ash (*Fraxinus americana*)
eastern cottonwood (*Populus deltoides*)
northern red oak (*Quercus rubra*)
post oak (*Quercus stallata*)
white oak (*Quercus alba*)
slippery elm (*Ulmus rubra*)
American elm (*Ulmus americana*)
black locust (*Robinia pseudoacacia*)

(This list is based on review of literature and data on Indiana bat roosting requirements. Possibility of adding other species as identified).

At least 3 live trees per acre > 20" dbh (of the species listed above) should always be maintained in the stand. (A tree with < 10% live canopy should be considered a snag). These should be the largest trees of these species remaining in the stand. An additional 6 live trees per acre > 11" dbh (of the species listed above) should also be maintained. (The "per acre" requirement can be expressed as the average per acre on a stand-wide basis, depending on the definition of a stand).

If there are no trees > 20" dbh to leave, then 16 live trees per acre should be left, and these should include the largest specimens of the preferred species remaining in the stand.

(THE OBJECTIVE OF THESE "LEAVE TREE" RESTRICTIONS IS TO MAINTAIN A COMPONENT OF LARGE, OVER MATURE TREES, IN THE STAND. THESE TREES ARE A VALUABLE COMPONENT OF INDIANA BAT HABITAT. THERE IS FLEXIBILITY IN THESE "LEAVE TREE" RESTRICTIONS IF IT CAN BE DEMONSTRATED THAT THE SAME OBJECTIVE CAN BE ACHIEVED IN A MANNER MORE EASILY INCORPORATED INTO THE TIMBER MANAGEMENT PROGRAM.).

5. No harvest or TSI activities within 100 feet on both sides of a perennial stream and within 50 feet on both sides of an intermittent stream.

6. No harvest of trees during the Indiana bat reproductive season (April 15 through September 15).

United States Department of the Interior

FISH AND WILDLIFE SERVICE
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(812) 334-4261 FAX 334-4273

IN REPLY REFER TO:

July 13, 2000

Michael P. McGowen
LTC, GS, INARNG
Post Commander
Headquarters Camp Atterbury
Maneuver Training Center
Edinburgh, Indiana 46124

Dear Lieutenant Colonel McGowen:

These are the U.S. Fish and Wildlife Service's (Service) comments on your letter, received July 12, 2000, regarding the potential for the cutting of trees at Camp Atterbury to affect the Federally-endangered Indiana bat, *Myotis sodalis*. Specifically, you questioned guidance from the Service's Bloomington Field Office (BFO) stating that the removal of trees 3 inches in diameter or larger has the potential to impact Indiana bats. These comments have been prepared under the authority of the Fish and Wildlife Coordination Act (16 U.S.C. 661 et seq.) and are consistent with the intent of the National Environmental Policy Act of 1969 and the Endangered Species Act of 1973 (ESA).

Until receiving your letter, BFO had not received a request for comments on the specific activities discussed in your letter. The issue of road maintenance requiring the clearing of small diameter trees had been raised in an E-mail message on June 15, 2000 from Mr. Eric Dohner, a consultant working on the ongoing consultations at Camp Atterbury. This message contained no specific information on the scope of clearing to be done or the location of proposed maintenance activities. A biologist from BFO responded to the E-mail later that same day. We noted that the clearing of trees down to 3 inches in diameter has the potential to impact Indiana bats, and that several options were available on how to proceed. Most important, we specifically noted that additional information was needed before we could respond adequately on this issue. We never received any additional information until receiving your letter. BFO was not made aware that this guidance was a particular cause for concern for Camp Atterbury. Now that we have been made aware of this issue, we can move forward with addressing your concerns.

The basis for our guidance regarding the need to consider Indiana bat impacts when cutting trees 3 inches or greater in diameter is that the best scientific data available has shown that this is the smallest diameter tree known to provide roosting habitat for Indiana bats. Because there is

documented evidence of Indiana bats roosting in trees this size, we are required under the ESA to consider potential impacts of cutting trees this size. The Service is required to consider potential impacts to a species unless "all of the reasonably expected effects of the proposed action will be beneficial, insignificant, or discountable." In the case of cutting of trees 3 inches or greater in diameter (during summer) we cannot discount the possibility that bats could be roosting in these small trees, unless we have data to support that decision. This same criterion is used uniformly for all Section 7 consultations in the State of Indiana.

Situations similar to that described in your letter, involving the clearing of relatively small diameter trees in an area dominated by mature forests, have arisen previously in Indiana. Typically, these situations have been resolved by clearing the trees during the period September 16 - April 14, when bats are not present. You have already noted that this is not practical in the case of your maintenance activities. Other options are available. We do not have sufficient details on the proposed project to assess which of these options would be feasible and fulfill Camp Atterbury's Section 7 requirements. After reviewing these potential options, please contact us with additional details on the proposed clearing and to discuss options for accomplishing the required maintenance activities:

1) A qualified wildlife biologist could conduct a site inspection of the area to be cleared to determine if any of the trees within the area proposed for clearing provide potential roosting habitat. BFO biologists could assist Camp Atterbury with this task and/or provide guidance for your natural resources staff to make this determination. If potential roost trees were identified, these could be individually marked. All trees and brush other than the individually marked trees could be cleared during the period when troop labor is available. Individually marked trees could be cleared during the period September 16 - April 14. Our experience suggests that we would find few 3 inch trees that provided potential Indiana bat roost sites.

2) All brush and trees less than 3 inches in diameter could be cleared during summer. Trees 3 inches in diameter or greater could be left and cleared during the period September 16 - April 14.

3) Conduct formal Section 7 consultation and receive an incidental take permit for potential take of Indiana bats associated with maintenance activities.

As noted in your letter, Camp Atterbury is currently preparing an Integrated Natural Resources Management Plan, an Endangered Species Management Plan for the Indiana bat (*Myotis sodalis*), and a Biological Assessment to evaluate the impacts of ongoing and proposed military training activities on the Indiana bat. The consultation on the cutting of small diameter trees for routine maintenance projects could be incorporated into these ongoing consultations with minimal additional effort. We previously discussed, with your consultant, the possibility that endangered species consultation for many of the "small" tree clearing projects required at Camp Atterbury could be incorporated into the ongoing consultations. It was our impression, based on our phone logs, that the decision had been made to proceed with this approach. Many of the tree clearing projects that currently require individual consultation under ESA could be handled collectively within the ongoing consultation. We still think this is a logical approach and will offer our technical assistance to Camp Atterbury in assessing how this approach could best work for you.

Your letter references the **Bloomington Field Office Indiana Bat Management Guidelines**. We wish to clarify that this guidance refers to Camp Atterbury's timber management program. As noted in the guidance, the objective of the leave tree restrictions is to maintain a component of large, over-mature trees in the stand, because these trees are considered essential to supply Indiana bat maternity roost sites (that is, roosts containing reproductively active females and their young). This guidance is not a reference to the minimum size tree that will be used by any roosting Indiana bat.

We hope that this letter clarifies BFO's guidance on the cutting of small diameter trees with reference to potential impacts to Indiana bats. Camp Atterbury supports one of the highest known concentrations of Indiana bat maternity colonies within the entire range of the species. Since the discovery of Indiana bats at the facility in 1997, Camp Atterbury has work closely with the Service's BFO to conserve Indiana bats. The Military Department of Indiana and the staff of Camp Atterbury have demonstrated a firm commitment to Indiana bat conservation, and we look forward to continued cooperation to protect this precious resource.

Please contact me at (812) 334-4261 x 217 if you want to discuss these issues further.

Sincerely yours,

Scott E. Pruitt
Acting Supervisor

cc: Charlie Wooley, Assistant Regional Director, U.S. Fish and Wildlife Service, Region 3

November 1, 2000

Nancy McWhorter
Camp Atterbury Army National Guard Training Site
Indiana National Guard
Edinburgh, IN 46129

Dear Ms. McWhorter:

The U.S. Fish and Wildlife Service's Bloomington Field Office has developed draft Endangered Species Act Section 7 guidance on the impact of clearing small-diameter trees on Indiana bat habitat in Indiana. Seasonal restrictions on the clearing of small-diameter trees, resulting from Section 7 consultation, have created management concerns on several military installations in Indiana, including Camp Atterbury. In response to those concerns, we have evaluated the potential impacts of clearing small-diameter trees on Indiana bats and developed the attached draft guidance which we hope may address some of the management concerns raised by natural resource managers on military areas, and at the same time avoid take of Indiana bats.

If the natural resources staff at Camp Atterbury has comments or suggestions on this draft guidance, we would value their input. If you have any questions please contact Lori Pruitt at (812) 334-4261, extension 211. If you have comments on the draft guidance, please provide those comments prior to December 15, 2000.

Sincerely yours,

Scott E. Pruitt
Acting Supervisor

DRAFT IN PROGRESS - NOVEMBER 2000

BLOOMINGTON FIELD OFFICE SECTION 7 GUIDANCE ON THE IMPACT OF CLEARING SMALL DIAMETER TREES ON INDIANA BAT HABITAT

These guidelines are currently under development and have not been adopted by the U.S. Fish & Wildlife Service (FWS) on a rangewide basis. This guidance is being provided to help land managers avoid take of Indiana bats and to anticipate the FWS response to proposed small-diameter tree clearing projects. Endangered Species Act (ESA) Section 7 consultation will be required even when these guidelines are followed, but it is anticipated that the consultation will be "informal" (as defined in the ESA).

During summer, female Indiana bats form colonies, typically under the bark of trees, where they bear and raise their young. The trees used by female bats and their young are called maternity roost trees. Indiana bat primary maternity colony roost trees (used by more than 30 bats on more than one occasion) are typically 11" d.b.h. or greater (most are actually much larger). Most colonies also utilize a number of alternate roost trees (used by smaller number of bats and less regularly). Alternate roost trees can be a range of diameters, but are also typically large diameter trees. The smallest known alternate maternity roost tree was 5.5" d.b.h. Male Indiana bats typically roost alone, and frequently change trees between nights. Male bats appear less selective in choosing roost sites. Male Indiana bats have been found roosting in trees as small as 3" d.b.h. In addition to providing roosting habitat, forested areas also provide foraging habitat and travel corridors for Indiana bats.

The fact that male bats have been found roosting in trees as small as 3" d.b.h. has raised the issue of whether or not clearing of small-diameter trees has the potential to result in take of bats, as defined by the Endangered Species Act of 1973, as amended (ESA). Projects which frequently require the clearing of small diameter trees include small-scale construction projects and maintenance of powerline right-of-way (ROWs), fencelines, and roads. The purpose of this guidance is to aid a land manager in determining whether or not a project involving the clearing of small-diameter trees is likely to affect Indiana bats. This guidance should not be used for projects involving the clearing of trees in stream or river corridors, or around other permanent water bodies. For purposes of this guidance, the following definitions will be used:

- **Linear maintenance projects** involve clearing along a linear feature. Examples include pipeline, roadway, and powerline ROWs. Total width of clearing must be $\leq$ 75 feet.

- **Small-scale construction projects** require the clearing of $\leq$ 1 acre of land.

- A **wooded landscape** is defined as having $\geq$ 50% wooded canopy cover. To determine % wooded canopy cover, center the project in a 2.5 mile radius circle and determine if $\geq$50% of the area covered by the circle is wooded. A 2.5 mile radius is the typical maximum foraging range of an Indiana bat maternity colony.

If you anticipate the clearing of small diameter trees (i.e., under 5" d.b.h.), the following steps should aid you in predicting Section 7 consultation requirements:

1. If you know that the project area is considered suitable Indiana bat habitat proceed to Step 2. If you are not sure that your project area is considered suitable Indiana bat habitat, contact the

Bloomington Field Office for help in making that determination.

2. Take of Indiana bats will be held to the insignificant or discountable level (i.e., should not require formal consultation under Section 7) for linear maintenance projects or small-scale construction projects that only remove woody vegetation < 3" d.b.h. No seasonal tree clearing restrictions are anticipated.

3. **In areas within wooded landscapes**: It is anticipated that there will be a better supply of current and future roost trees for Indiana bats in wooded landscapes, compared to areas that do not meet this definition. Therefore, restrictions on the clearing of small-diameter trees are typically less stringent in wooded landscapes. As indicated in Step 2, no restrictions are anticipated for clearing woody vegetation < 3" d.b.h. In addition, larger trees ($\geq$ 3" d.b.h. but $\leq$ 5" d.b.h.) can also be cleared for linear maintenance projects or small-scale construction projects in wooded landscapes. However, 3-5" trees can only be cleared if there is wooded habitat contiguous to the clearing that is at least as large (in area) as the clearing. (The purpose of this criterion is to protect isolated blocks of wooded habitat, particularly those that may be important as travel corridors for bats. For example, if a wooded fenceline bisects a non-wooded area, that fenceline may be particularly important to bats, even though the total wooded area involved is small).

4. For clearing of trees over 5" d.b.h., informal Section 7 consultation will likely require procedures to avoid take of Indiana bats. In many cases, seasonal tree clearing restrictions (i.e., no tree clearing from April 15 through September 15) will be sufficient to avoid take of bats. However, measures that will be needed to avoid take will vary among projects and will be determined through informal consultation with the FWS. If take cannot be avoided, formal Section 7 consultation will be required.

These are general guidelines and site specific conditions, cumulative impacts, indirect effects, etc. may dictate deviation from them. Additionally, knowledge of the Indiana bat population on a particular site must be considered. As previously noted, even if a land manager is certain that a project meets the definition of a linear maintenance project or a small-scale construction project, as defined in this guidance, consultation with the Bloomington Field Office is still required.

United States Department of the Interior

FISH AND WILDLIFE SERVICE

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November 6, 2000

Michael P. McGowen
LTC, GS, INARNG
Post Commander
Headquarters Camp Atterbury
Maneuver Training Center
Edinburgh, Indiana 46124

Dear Lieutenant Colonel McGowen:

This letter constitutes the U.S. Fish and Wildlife Service's (Service) amendment to the December 4, 1998, Biological Opinion on the Construction and Operation of the Multi-Purpose Training Range (MPTR) at the Camp Atterbury Army National Guard Training Site, located in Edinburgh, Indiana (Bartholomew, Johnson, and Brown Counties). This amendment has been prepared in response to your letter of October 13, 2000, which detailed additional tree clearing that will be required for the construction of the MPTR that was not considered in the Army's August 1998 Biological Assessment: Effects to Indiana Bats and Bald Eagles from Construction and Operation of the Proposed Multi-Purpose Training Range (hereafter referred to as the biological assessment), or in the subsequent biological opinion prepared by the Service's Bloomington Field Office (BFO). In addition to your letter of October 13, additional sources of information used to prepare this amendment included: 1) your letter dated September 19 (requesting guidance from the Service on how to proceed with consultation); 2) phone calls with your Environmental and Natural Resources staff; 3) a site visit to Atterbury by a BFO biologist, accompanied by Nancy McWhorter of your staff, on October 26, 2000.

The 1998 Final Environmental Impact Statement for the Proposed Upgrade of Training Areas and Facilities and the biological assessment indicated that construction and operation of the MPTR would result in the clearing of 99.7 hectares of forested habitat suitable for summering Indiana bats (*Myotis sodalis*). Tree clearing was conducted from January to April 1999. No trees were felled within the MPTR construction boundaries during the Indiana bat reproductive season (April 15 through September 15) to avoid injuring or killing bats by felling a roost tree when bats were present. To minimize the impacts of habitat loss to Indiana bats, Camp Atterbury set aside 270 hectares, of which 201 acres were forested, for Indiana Bat Management Zones (BMZs). Management of the BMZs is limited to activities that will enhance the value of the areas for Indiana bats. BMZs were located adjacent to the proposed MPTR to provide habitat for individual

bats that would experience habitat loss associated with the construction and operation of the MPTR.

As a result of the Army updating Tank and Gunnery Standards, upon which the MPTR was designed and is being built, additional tree clearing is needed to complete construction of the MPTR. Specifically, an additional 21.3 ha of trees need to be cleared to allow for targets to be relocated and to accomplish the line of sight to accommodate the change in target locations. Of that 21.3 ha, 8.9 ha are in the BMZ, to the north of the original construction boundary, and the remaining 12.4 ha are areas adjacent to the construction boundary in the southern portion of the MPTR. A map of the areas to be cleared (enclosure 2 in your October 13 letter) is hereby incorporated by reference.

The Army will take the following steps to avoid and minimize take associated with the additional clearing that is required:

1. None of the additional clearing will be done during the Indiana bat reproductive season (April 15 through September 15).

2. The Army will establish an additional 53.5 ha of BMZ in the northeastern corner of the installation. The map of this area (provided in your October 13 letter) is hereby incorporated by reference. With the 261.1 ha of BMZ that will remain to the north of the MPTR, this will bring the total acreage of BMZs on the facility to 314.6 ha.

3. Within the 261.1 ha of BMZ that is adjacent to the MPTR to the north, the Army will establish permanent water sources (small ponds) to provide additional drinking water and foraging habitat for Indiana bats. The lack of open water areas has been identified as a potential limiting factor to bats in this area. The Army will establish at least 1 acre of open water (total of at least one acre can be in one or more ponds) in the BMZ prior to the April 15, 2002.

The above avoidance and minimization procedures are expected to offset the negative effects of the additional clearing that will be required to complete the MPTR, and may potentially result in a net benefit for Indiana bats. The 21.3 ha of forested habitat that will be cleared (including 8.9 ha of BMZ) will be replaced with an additional 53.5 ha of BMZ. The replacement BMZ is in a portion of the base that gets minimal use for training, and the level of disturbance in this area is low. The area is also known to be used by Indiana bats. Indiana bats were caught in this area during both 1997 and 1998 surveys. In 1998, 3 alternate maternity roost trees were located in or immediately adjacent to this area. This is a higher level of use than was documented in the existing BMZ. Sugar Creek, a perennial stream, runs through the replacement BMZ parcel; this permanent source of water enhances the value of this parcel for Indiana bats. This parcel is frequently flooded which has resulted in a sparse understory, which likely enhances the value of the area for foraging bats. It is expected that insect production in this parcel is relatively high, although no data are available to document this. Portions of the parcel are not well stocked with trees, likely due to frequent flooding, and this is reflected in the forest survey data provided by Atterbury. However, some portions contain adequate numbers of large diameter live trees and snags, including eastern cottonwood, white ash, and silver maple, to provide quality roosting habitat for Indiana bats. Research has suggested that large cottonwoods appear to be particularly

important to roosting bats at Atterbury.

It should be noted that much of the information used for the above analysis was collected during a 1998 mist netting and telemetry study at Atterbury. This study was conducted at the discretion of the Army as the result of a **CONSERVATION RECOMMENDATION** that was made in conjunction with the December 1998 biological opinion. The Army is to be commended for funding this research, the results of which have already been applied to efforts to conserve Indiana bats on the installation.

Indiana bat roosting and foraging habitat will be lost in the area where the additional clearing for the MPTR occurs. Previous analyses (discussed in the biological assessment and the biological opinion) suggest that 1 maternity colony of Indiana bats likely utilized the area originally cleared for the MPTR. It is assumed that this maternity colony relocated to an adjacent portion of the base and utilizes the habitat in the existing BMZ, but this has not been verified. The lack of permanent open water sources has been identified as a potential limiting factor to bats in this portion of the base. The establishment of one or more permanent water sources in the existing BMZ will enhance habitat quality in this area and directly benefit bats in this portion of the base.

AMENDED INCIDENTAL TAKE STATEMENT

Unless specifically noted here, the analyses on the amount and effect of take, reasonable and prudent measures, and terms and conditions of the December 1998 Incidental Take Statement remain unchanged.

AMOUNT OR EXTENT OF TAKE

The following sentence occurs in the December 1998 Incidental Take Statement: "Therefore, the anticipated level of take is expressed as the permanent loss of 99.7 ha of forest, as designated in the biological assessment, that is currently suitable summer roosting and foraging habitat for Indiana bats and that will be cleared for the construction and operation of the MPTR at Camp Atterbury." Because an additional 21.3 ha of clearing is now required for completion of the MPTR, under this amendment the level of take will now be expressed as the permanent loss of 121 ha of forest that was suitable summer roost and foraging habitat for Indiana bats.

REASONABLE AND PRUDENT MEASURES

All reasonable and prudent measures from the December 1998 Incidental Take Statement are unchanged. In addition, the 3 avoidance and minimization features discussed above (seasonal restriction on tree clearing, establish additional 53.5 ha of BMZ, and establish permanent water sources in existing BMZ) are incorporated as additional reasonable and prudent measures under this amendment.

TERMS AND CONDITIONS

All terms and conditions from the December 1998 Incidental Take Statement are unchanged. Term and condition 2 includes a requirement for the Army to establish procedures for evaluating

bat habitat quality in the BMZs. Some progress has been made on the development of these procedures, but the Army has requested technical assistance from the Service to complete this task. The Service's BFO hereby commits to working closely with the Environmental and Natural Resources staff at Atterbury to develop these habitat assessment procedures. The Army, in consultation with the Service, will establish draft procedures to evaluate bat habitat quality within the BMZs by March 31, 2001.

Camp Atterbury supports one of the highest known concentrations of Indiana bat maternity colonies within the entire range of the species. Since the discovery of Indiana bats at the facility in 1997, Camp Atterbury has worked closely with the Service's BFO to conserve Indiana bats. The Military Department of Indiana and the staff of Camp Atterbury have demonstrated a firm commitment to Indiana bat conservation, and we look forward to continued cooperation to protect this precious resource.

Please contact Lori Pruitt at (812) 334-4261 x 211 if you have questions or comments related to this amendment or other issues relative to Indiana bats at Camp Atterbury.

Sincerely yours,

Scott E. Pruitt
Acting Supervisor

IN REPLY REFER TO:

United States Department of the Interior

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May 7, 2001

Michael P. McGowen
LTC, GS, INARNG
Post Commander
Headquarters Camp Atterbury
Maneuver Training Center
Edinburgh, Indiana 46124

Dear Lieutenant Colonel McGowen:

This is the U.S. Fish and Wildlife Service's (Service) response to the April 16, 2001 request for comments on the Integrated Natural Resources Management Plan (INRMP) and Endangered Species Management Plan (ESMP) for Camp Atterbury, Indiana. These comments have been prepared under the authority of the Fish and Wildlife Coordination Act (16 U.S.C. 661 et seq.) and are consistent with the intent of the National Environmental Policy Act of 1969, the Endangered Species Act of 1973, as amended (ESA), and Service Mitigation Policy.

The INRMP is thorough and provides a good framework for the management of natural resources on the facility. The Service particularly wants to commend the Army for efforts to conserve the Federally-endangered Indiana bat (*Myotis sodalis*) on the facility. Camp Atterbury supports one of the highest known concentrations of Indiana bat maternity colonies known in the State of Indiana. Since the discovery of Indiana bats at Camp Atterbury in 1997, the Service's Bloomington Field Office (BFO) has worked closely with Camp Atterbury to insure that activities on the base were in compliance with the ESA. The INRMP reflects that the Army is not only committed to meeting ESA requirements, but also to the long-term conservation of the Indiana bat at Camp Atterbury.

Specific comments, referenced by page number, follow. Page references refer to the INRMP unless otherwise noted.

INRMP Comments

1. In the August 1998 Biological Assessment: Effects to Indiana Bats and Bald Eagles from the Construction and Operation of the Proposed Multi-Purpose Training Range, the Military

Department of Indiana proposed to set aside 270 ha of Indiana Bat Management Zones (IBMZs) to minimize the impacts of clearing required for the Multi-Purpose Training Range (MPTR) on Indiana bats. The Service incorporated the establishment of IBMZs into the Biological Opinion which was issued on December 4, 1998. The Service amended the Biological Opinion on November 6, 2000 to allow for additional tree clearing that was required for the construction of the MPTR. As the result of this amendment, an additional IBMZ was established, bringing the total acreage of IBMZs on the facility to 314.6 ha.

Throughout both the INRMP and the ESMP there are references to the IBMZs that have been established on Camp Atterbury. Some of these references fail to reflect the changes in the IBMZs that were made in conjunction with the November 6, 2000 amendment to the Biological Opinion. For example, maps on pages 4-20 and 5-104 do not include the IBMZ added in November 2000, and they also do not reflect the portions of the existing IBMZs that were cleared for MPTR construction. There are also references in the text (e.g., page 4-22 of the INRMP and page 4-4 of the ESMP) that 667 acres have been set aside for IBMZs; this figure does not reflect the changes resulting from the November 6, 2000 amendment.

2. Page 5-23 states: "Snags and dead trees will be removed if they interfere with landscape objectives or if their presence endangers personnel, roadways, power lines, buildings, training structures, or high-use areas such as bivouac areas." We recommend that this statement be modified to reflect that Atterbury will continue to consult with the Service, to the extent practical, regarding potential impacts to the Indiana bat when removing snags.

3. Page 5-24. In order to maximize the value of wood duck boxes on Camp Atterbury, we recommend that you carefully consider placement of boxes. If present, natural tree cavities are preferred over nest boxes. Placement of boxes has been shown to affect intra specific brood parasitism rates (Semel and Sherman 1995). Bellrose and Holm (1994) provide guidance on wood duck nest box placement. Summaries of these references are enclosed. The Waterfowl Biologist from the Indiana Department of Natural Resources, Division of Fish and Wildlife, may be able to provide additional guidance on this point.

4. Page 5-25. Times designated for burning (March to early April and October to November) occur outside the Indiana bat maternity roosting season (April 15 - September 15). Therefore, potential impacts on roosting bats are avoided. It should be noted that if burning occurs during the maternity roost season that the Service would be contacted regarding potential impacts on Indiana bats.

5. Figures 5-3 and 5-4 provide information on the density and distribution of mature trees. This information is helpful in evaluating the quality of Indiana bat habitat. However, the light blue shading (which covers the bulk of the map) is not represented in the legend; does that area have no mature trees? Is any tree of the species listed on page 5-43 considered a "potential bat roosting tree" (as used in Figure 5-3) regardless of the diameter of the tree?

6. The description of the roosting habitat needs of Indiana bats in section 5.10.1.1 (pages 5-80-81) includes the statement: "The colonies may consist of more than of 100 adult females, and in one season, the bats may use two to four different roost trees." Research has demonstrated that the number of roost trees used by one maternity colony varies across the range of the species, and among years, but most colonies that have been studied have used in excess of four roost trees during a maternity roosting season. For example, research conducted on Camp Atterbury in 1998 suggested that the most intensely studied maternity colony used two primary roosts (used by more than 30 bats on more than one occasion) and nine alternate roosts (used less frequently and by fewer bats). Another study conducted in central Indiana in 1999 revealed that one maternity colony used one primary and 12 alternate roosts. It should be pointed out that these numbers represent the minimum number of roosts used by the colonies; this is the number of roosts in which radio-tagged bats were known to be located. Almost certainly, additional roosts were used by the colony and not detected.

The major point that should be emphasized in the discussion of roosting habitat is that a maternity colony of Indiana bats requires a large number of roost trees which provide a variety of roosting conditions within the range of the colony. Therefore, the emphasis of roost tree management should not be on individual trees, but rather on providing a good supply of suitable roost trees and managing to sustain the supply of roost trees over time. This, in fact, is the approach that is being applied at Camp Atterbury.

7. Page 5-81 indicates that the USFWS issued a Biological Opinion on the MPTR in 1999. The Opinion was issued on December 4, 1998.

8. Page 5-86 indicates that "an Indiana bat monitoring program will be established and conducted yearly." (Pages 5-122 and 5-129 also contain references to an annual monitoring program). We recommend noting that the monitoring program is currently being developed in consultation with the Service.

9. Page 5-110 includes the statement: "There has been no documented use of snags on Camp Atterbury." There has been documented use of snags by Indiana bats. ??

10. Page 5-120 indicates that 778 acres has been set aside as IBMZs on Camp Atterbury, which we agree is the correct acreage. However, the statement that 630 acres of the IBMZs are forested may not be accurate. It is not clear to us that this figure reflects the additional clearing done in 2000, which included a portion (8.9 ha) of an existing IBMZ that was forested (reference September 19, 2000 and October 13, 2000 letters from Camp Atterbury to the Service's Bloomington Field Office).

11. Extensive comments on state and federal status of species listed in Appendices D and E were provided in the Service's comments on the Draft INRMP (this letter is included in Appendix A of the INRMP), but corrections were not incorporated into the INRMP. We recommend that these corrections be incorporated, particularly with reference to Federal Candidate species.

ESMP Comments

1. Section 2.2.2 Distribution. Updated information is available on hibernacula in Indiana. Based on 1999 hibernacula counts, the largest hibernacula in the State was located in Greene County, approximately 60 km southwest of Camp Atterbury. During the 1999 hibernacula count, Indiana bats that had been banded at Camp Atterbury during the summer of 1998 were documented in that cave. This cave is now a Priority 1 hibernacula.

2. Section 2.2.3 Habitat Requirements. Some of the information in the INRMP was derived from the 1999 Draft Indiana Bat Recovery Plan. Unfortunately, portions of this draft plan misrepresented some of the information on Indiana bat summer habitat requirements. These portions of the plan will be revised. The draft plan includes comments regarding Indiana bat use of "highly altered landscapes" and the potential that Indiana bats may benefit from "habitat disturbance." There is no scientific evidence to support the contention that Indiana bats respond positively to habitat disturbance. These are generalizations that do not accurately portray the current state of understanding of Indiana bat summer habitat. These comments suggest that because Indiana bats have been found in altered landscapes that these are preferred, and do not account for the fact that most forested habitat remaining within the range of Indiana bats has been "disturbed." The draft plan also does not account for the role of philopatry in roost tree selection by Indiana bats on sites that have been altered. As noted in the draft recovery plan, it is well documented that Indiana bats exhibit fidelity to their summer home range. An Indiana bat maternity colony on a disturbed or altered site may be selected not so much on the basis of habitat suitability as site fidelity. The fact that bats are found in an area that is altered does not necessarily indicate a preference on the part of the bats or that the area provides high quality habitat. Potentially, it may just be an artifact of site fidelity; the bats return to the area even if the alteration has lowered the habitat quality of the site.

The highest densities of Indiana bat maternity colonies found to date in the State of Indiana have been associated with relatively large blocks of mature to over-mature forests. Camp Atterbury is an excellent example of such a site.

Another example of "disturbance" discussed in the draft plan that is referenced in the INRMP is cutting down a maternity roost tree. The following statement occurs in the draft plan:

> "A couple of maternity colonies, including the first discovered maternity roost in Indiana, were found when a tree was cut down and the bats moved to another tree. These observations suggest that the Indiana bat may be a more adaptable species than previously thought."

We cannot conclude from this statement that trees containing Indiana bat maternity colonies can be cut down, while the bats are present, without harm to the colony. The observation of displaced bats moving to another tree certainly does not provide evidence that the bats were not harmed. The bats would be expected to flee when the tree was cut down; the alternative would

be for the bats to remain in the tree throughout the disturbance caused by the cutting and felling of the roost tree. The ultimate fate of those bats, not their immediate reaction to the cutting of the tree, is the issue. Possibly, the bats simply moved to another tree and survived, although there is documentation of direct mortality of Indiana bats associated with the cutting of a roost tree. In addition, it is also probable that some bats in a felled tree may survive the felling of the roost, but subsequently experience stress-related mortality, decreased productivity, or other potential forms of harm related to the loss of the maternity roost.

3. Section 4.1.1 Forest Management. The INRMP incorporates the Bloomington Field Office forest management guidance for Indiana bats. It should be noted that this guidance was designed to avoid take of Indiana bats associated with forest management activities. If this guidance is followed during forest management activities, the Service has determined that the activity is not likely to adversely affect the Indiana bat, and therefore further consultation is not required. For activities that cannot be conducted within the scope of this guidance, then additional consultation will be required. For example, as noted in the INRMP, the Service will be consulted regarding TSI activities on cottonwood trees within 100 feet of a perennial stream or 50 feet of an intermittent stream. Similarly, it should be noted that harvest of trees for road maintenance projects during the Indiana bat reproductive season will also require consultation on a case-by-case basis (unless consultation on these activities is covered during the consultation on training and mission-related activities).

4. Section 4.1.2 Indiana Bat Management Zones. Page 4-4: total area of IBMZs on the facility is not accurate. Page 4-5 discusses management measures that will be implemented in the IBMZs. The Biological Opinion issued on the MPTR states: "Silvicultural manipulation in Indiana Bat Management Zones will be limited to activities intended to enhance summer habitat for Indiana bats, and will be developed in consultation with and approved by the Service." The Opinion further states that management prescriptions to be implemented in the IBMZs will be cooperatively developed by the Service and the Army based on information collected during habitat evaluations that will be conducted in the bat management zones. Until procedures for habitat evaluation are developed and implemented, management prescriptions should not be initiated.

5. Section 4.1.8 Annual Report to the U.S. Fish and Wildlife Service. The following Term and Condition from the December 1999 Incidental Take Statement should be included in the information required in the annual report:

"Camp Atterbury will use results of biomonitoring conducted at Fort Leonard Wood, Missouri to evaluate potential toxicological effects of M18 colored smoke grenades to Indiana bats. During January through March 1999-2003, Camp Atterbury will review results presented in annual reports prepared by Fort Leonard Wood and submitted to the Service as required by the Terms and Conditions in the Biological Opinion/Take Statement for Base Realignment and Closure activities at Fort Leonard Wood. Chemical analyses of surrogate bat tissue (whole body analyses), gross anatomical and histopathological tissue analyses of surrogate bat lung tissue,

chemical analyses of guano, and chemical analyses of fish and sediment shall be reviewed. If detectable amounts of terephthalic acid (TPA) or lung damage are noted in samples collected at Fort Leonard Wood, but not in samples collected at reference sites, Camp Atterbury shall initiate an investigation to assess the potential for M18 colored smoke grenades to cause injury to Indiana bats at Camp Atterbury. A draft study plan for investigating effects of M18 colored smoke grenades shall be submitted to and approved by the Service at least 60 days prior to initiation of the proposed study."

6. Section 4.2 Monitoring. "Species" should be added to the minimum information required for each bat captured.

We appreciate the opportunity to comment on the Camp Atterbury INRMP and look forward to continued cooperation with the Army in the completion of the plan. This plan reflects that endangered, threatened and rare species are valued for their contributions to the unique natural heritage of Camp Atterbury, and the Service fully supports the Army's goal of protecting those resources. If you have any questions or require additional technical assistance, please contact Lori Pruitt at (812) 334-4261, extension 211.

Sincerely yours,

Scott E. Pruitt
Supervisor